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The Use of Lime in Glass

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Lime is one of the most important raw materials used in the manufacture of nearly all kinds of glass, and its selection should be made with great care in regard to the chemical composition, the degree of fineness, and the source of supply.

Lime is used in making glass for bottles, jars, tumblers, lamp chimneys, tubing, tableware, pressed articles, and in window glass and plate glass. In some types of glass, such as optical glass, heat-resistant glass, chemical and scientific glass, lime is either entirely or partly replaced by zinc, barium, lead, magnesia, and other chemicals.

The function of lime in the glass batch is to act as a flux, and in conjunction with the soda ash, it forms glass by uniting with the sand.

Lime imparts smoothness and brilliancy to glass, and increases its power of resistance to chemical agents. Increasing the lime increases the fusibility to a certain extent, and tends to prevent cords, but at the same time it increases the tendency to devitrify. Glass with a high lime content is hard and brittle, and must be annealed more carefully than one with a low lime content.

There are three forms of lime used in glass; namely: burnt lime, limestone or raw lime, and hydrated lime. Hydrated lime is seldom used, as it is difficult and unpleasant to handle, and its cost is much greater than the other forms of lime. Lime exists in two different chemical types, that is, as high-calcium lime, and as high-magnesia lime, or dolomite. High-calcium lime contains very little or no magnesia, and dolomite lime contains lime (calcium) and magnesia in the proportions of about three to two. Dolomite is usually preferred for pressed and blown articles, as magnesia in glass lowers the coefficient of expansion and tends to prevent devitrification. In making plate glass and window glass, high calcium lime is probably more widely used than the dolomite.

There is a great difference of opinion among glass manufacturers and technical men as to the relative merits of limestone and burnt lime. Before deciding upon which of the two to use, several items should be taken into consideration. Burnt lime is usually freer from impurities than raw lime, requires less space for storage, and in the writer's opinion, it is easier to maintain a good color in flint glass when burnt lime is used. On the other hand, limestone is not affected by atmospheric conditions, while burnt lime absorbs moisture and carbon dioxide in transit and in storage. However, if it is stored in a dry place, burnt lime will very seldom absorb much more than five or six per cent, even after standing ten days or two weeks. A good plan is to have an analysis of the lime made when it is received, and then determine the ignition loss once each week. Limestone may require slightly more heat for melting, but limestone liberates a large amount of gas (carbon dioxide) which aids in clearing the glass. Limestone contains about 54 or 56 per cent of calcium oxide (or calcium and magnesia oxides), and burnt lime contains 95 to 97 per cent, so that 100 pounds of burnt lime is equivalent to approximately 176 to 178 pounds of limestone.

It is the practice of some manufacturers to use burnt lime in their flint glass, and to use raw lime in their amber, blue or green glass. This is a good plan provided that there is no loss in the tonnage of colored glass melted, as compared with burnt lime. While I personally have a preference for burnt lime, in my mind the logical way to decide whether raw or burnt lime should be used, is to make systematic tests in each individual case, and then decide in favor of the one which shows better results. Limestone is almost always used in making plate glass and window glass, mainly because along with salt cake, a cheap glass is produced.

After the question of burnt or raw lime has been settled, the next important item to be considered is how much lime to use. Here again, there is a wide divergence of opinion, as some authorities advocate a high lime content, while others claim that less lime should be used. The recent tendency has been toward reducing the lime, and to introduce alumina into the glass. This produces a glass which is less brittle and more ductile, and such glass is more adaptable for automatic operation. For hand operation a higher lime content can be used without bad effects. In the writer's opinion (which has been substantiated in many instances) the ideal amount of lime (burnt) for the general line of pressed or blown articles is from 90 to 100 pounds to the 1,000 pounds of sand.

However, it is difficult, and not at all advisable to state a

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definite rule as to the amount of lime to be used, because every plant has more or less different conditions which may necessitate a slight change in the composition of the glass desired. For example, different types of feeders or machines may require different natured glass, or one factory may maintain higher temperatures in its tanks, which would cause the glass to be softer and more fluid than it would be in another instance.

There exists among some glass makers a belief that increasing the amount of lime in the batch acts as a remedy for all the troubles that they experience at times with their glass. When the glass becomes cordy or wavy, if it is seedy or slow melting, or when it does not seem to work satisfactorily, their first act is to put more lime in the batch. In most cases, entirely some other cause is present, such as a lowering of the tank temperature, too much cullet, insufficient mixing of the batch, or something else which is not thought of immediately.

When a glass firm secures a dependable source of pure lime, it has taken a big step in the right direction to avoid trouble with its glass; and even though cheaper lime can be obtained, a thorough investigation of the amount of glass melted, the production, and the quality of glass being packed will nearly always show that after all it is more economical and more satisfactory in every way to use the best of material in the batch.

Lime for making high grade glass should contain 0.07 per cent or less of ferric oxide, and only small amounts of other impurities, such as alumina and silica. Of course, any alumina present in the lime would not be an objection, but the amount present should be known, and taken into consideration. Burnt lime should be fine enough to completely pass through a ten or twelve mesh screen, and while some firms prefer coarse limestone, I would recommend that if lime is used in this form, it should be more finely divided than the burnt lime.

The Packing of Glass Ware

From a Glass Packer's Note Book

In describing the progress and improvement made in the past few years in all phases of glass manufacturing, liberal use of adjectives in the superlative degree has been so fully justified that words such as "wonderful," "extraordinary," "unprecedented," etc., have become as slick as an 1886 nickel from constant use. While our subject for consideration does not, perhaps, merit any large type announcements, yet it is one of those humble factors which contribute largely either to success or failure. However, it is rarely given the care which it deserves. As a matter of fact, until the advertising value of the package was discovered, the whole subject of packages and packing was regarded by most glass manufacturers as a necessary evil and charged at one hundred per cent to expense with no asset value.

The methods of packing glassware for safe delivery have not undergone so radical a change, nor conspicuous an improvement as have the methods of compounding and forming glass into useful articles, but the manufacturer who has not given the subject careful study is overlooking a real part of his business. Particularly in the case of the cheaper and bulkier articles, economy in the packing and package may prove on careful analysis an important factor in per cent of total value.

Changes have taken place in most plants in packing practice since those recent, though primitive days of glass making, when perhaps more expensive materials were used in the batch but when they were mixed and melted with little knowledge of chemical combination or furnace management, and when inferior metal was "bad luck." Then barrels and wooden boxes were packages and hay, straw and old newspapers were packing materials. All knowledge of how to assemble the two with the glassware and get them safely started towards the customer was the personal property of the "packer," an individual of the old order whom we do not wish to disparage. A good specimen of the genus compared quite favorably in a gray-matter inventory with his more aristocratic companion the autocratic member of the "Skilled Glass Worker" trade. An accurate balance would doubtless show that the old-time packer seldom got the credit for what he did with the materials at his disposal.

Box making and coopering were two attendant nuisances, disposed of with the least worry possible. A very common practice was to buy boxes in shooks or piece stuff and barrels in sets of approximately proper sizes and then "farm out" or contract the making on a piece work basis and thus dispose of the matter with the least mental effort. This plan did not result in an extra number or size of nails being used, but it made it possible for a "contractor box man" to deliver at an agreed price. His profits made it easy for a manufacturer of glassware to secure a box contractor and forget his box problem—perhaps. This picture need not be further drawn—the present is of more interest to us and more agreeable to look upon.

While no "wizards" nor great genius perhaps is found in the package game, real, steady, consistent progress has been made and those who have given proper consideration to the subject have found ample field for economies and good investments in improved methods and materials. Many of the larger glass manufacturing concerns now produce all of their own packages and packing materials from the original raw state, operating their own wooden box factories and paper box plants, some even making all of their own paper. They have also made liberal allowances for research work and have kept competent men at work determining the best package and packing for each individual article of glassware, for there is seldom a best package or best packing for any line. This must be decided individually with regard to weight, fragility, and value of article to be packed, compared with qualities and cost of packing. Decision on the proper package for any article must include consideration of several or all. Each variation in the article to be packed must be considered in relation to the merits or faults of

material, grade, and style of construction used in package and protection. Thus for an article up to a certain size we may find one package entirely satisfactory in service and cheapest in use, but above the size limit modifications are required, or the packing method may even become entirely unsuitable.

Thus a classification of packages becomes quite complicated and a properly organized department with capable and experienced personnel quickly and surely becomes an asset.

ANY manufacturer of glassware can obtain valuable information on packing problems from various organizations which conduct research and advisory departments devoted to this subject. Among them are the National Container Association, 608 South Dearborn street, Chicago, Illinois, fibre cartons; United States Forest Products Laboratory, Madison, Wisconsin, fibre cartons and wooden boxes; National Association of Box Manufacturers, 844 North Rush street, Chicago, Illinois, wooden boxes.

Interior Packing Materials

Packing materials used for protection within the package may perhaps best be considered first for two reasons; first, no package for glassware can be considered without giving due attention also to the interior packing used in combination with it.

Second, the problem of proper packing for safe shipment is almost entirely a problem of internal protection, not external. Those who have spent much time viewing the subject from any other angle have not made much progress. This may sound like a simple statement but there are many pages of package history, all amusing and some financially tragical.

Some of the materials which have been and are used for packing protection are hay, straw, excelsior, saw dust, cork and cork powder, waste paper, old newspaper, veneered wood, and corrugated fibre board or corrugated paper. Each of these has advantages and merits as well as faults.

Hay, straw and excelsior perhaps may be considered of equal value and one possessing about the same qualities as the other, on a basis of cost. All three make suitable protection provided the article packed will stand stuffing or can be packed and shipped under some compression, as this is necessary to hold the material in place. In this case the elasticity or resiliency of the article packed combines with that of packing material. All three have particular value in that saturation with liquid does not destroy their protective value. They have the faults that they cannot be handled without litter and increased fire hazard and require skilled help to apply properly. Even with skilled help the time cost is high for most uses.

Sawdust has the faults of the three first mentioned, and in addition that it cannot be made to stay in position and requires a more expensive, tighter package to prevent leakage.

Loose cork waste or cork dust has little advantage over sawdust. But if applied in combination with paper so that it can be kept in position it becomes one of the best materials available. However it cannot withstand moisture and is prohibitive in most cases due to lack of supply and high cost.

Waste paper and old newspaper have slight merit, except low cost. Their use detracts from the appearance of the glassware packed and that decreases its sales value.

Veneered wood has been used very successfully for protecting heavy articles. It can compete with hay, straw and excelsior for the packing of heavy articles and gives a much neater package. However its cost is higher.

Corrugated fibre in various weights and qualities and suitable for a variety of uses promises to supplant all other materials in the future. It has already done so in some lines at the present time. Its present limiting factors are price and lack of thorough waterproofing.

As corrugated fibre material is supplied in various weights and grades, each of different strength and resiliency, the lightest and cheapest grade should be selected possessing required cushioning property for the article to be protected. The form or shape should be made such as will give greatest possible bearing surface or contact. Any article whose nature or shape is such that it must be packed with much stuffing or compression to keep it in place should be packed in a rigid wooden box, also any packing material which requires compression usually requires a wooden box. The ideal packing material requiring minimum compression permits the use of fibre carton.

All papers such as the gray felt "carpet" paper used for some purposes on account of low cost, require more or less compression on the glassware packed to avoid shifting of contents. This compression of course is added to the force of external shock which must be withstood and adds the weight and momentum of all articles in the package increasing by the dimension of the package, which falls heaviest on the last article in a row. The ideal packing—price permitting—must provide complete *individual* protection to each article in the package. This in turn requires that the packing material provide the necessary cushioning or resiliency, that each article be held firmly in place, with merely enough compression for support. This corrugated fibre sheet or "board" in its many grades and weights and qualities will do for almost any conceivable condition. It remains to choose the minimum weight and cheapest grade that will safely perform the service and decide how it should be applied. The proper application may be accomplished in various ways, ranging from simple sheets and strips or cells, to complicated die-cut and glued up forms of twenty or more pieces as may be required.

The problem of the glass package is mostly internal not external and with this in mind protection for shipment should be designed from the inside and the outer package merely made to conform and complete.

Exterior Packing Materials

A classification of packages may be made into barrels,

wooden boxes, solid fibre boxes and corrugated fibre board boxes, each of which may be further sub-divided into classes by style of construction and material. Each of these has its merits and faults; each with proper interior packing is best adapted to some uses for certain reasons which may be determined.

While we cannot enumerate the uses for which each may be best adapted a comparison with requirements will determine that.

Some of the chief qualities to consider for a suitable glass package are:

(1) STRENGTH. With some contents and methods of packing the ability to withstand a bursting strain from inside as well as external forces.
(2) RIGIDITY. Vital to most glass packages.
(3) WATERPROOF. As expressing ability to withstand saturation with liquid without collapse or disintegration.
(4) CAPABILITY OF ALTERATION. As in size or construction for different use than originally intended.
(5) SAFE HANDLING. Liability of employees being injured, etc.
(6) DETERIORATION—of package value in storage.
(7) Weight.
(8) Bulk—Storage space required to store empty.
(9) Practical size unit.
(10) Piling in storage filled.
(11) Value as an advertising medium.
(12) Ease and cost of packing and sealing.
(13) Proof against pilfering or opening.
(14) Cost to handle in storage and shipment after packing.
(15) Original cost of package.

Specifications of packages as established by common carriers and the Interstate Commerce Commission should not be taken as standards by glass manufacturers. Some modifications must be made, otherwise a very inefficient and inadequate package would be the result. An intelligent choice of the exact style of package and of interior packing must be made for each article.

The Barrel

Barrels are used less than formerly mainly due to size, weight and difficulty of keeping its contents in the proper position when rolled. Rolling is the most natural manner of moving, owing to shape and weight of the package.

(1) STRENGTH. When properly made the factor of strength is not lacking. The weight limit will be exceeded before there is any danger of lack of strength.
(2) RIGIDITY. Also more than adequate.
(3) WATERPROOF. May be lined with oiled paper and ranks high in this respect.
(4) CAPABILITY OF ALTERATION. Lacking.
(5) SAFE HANDLING. Ranks very low and is responsible for much breakage.
(6) DETERIORATION IN STORAGE FOR USE. Practically none.
(7) WEIGHT. Weight of package in proportion to weight of contents very low. Gross weight over net weight of contents does not add much freight.
(8) BULK. In storage, if carried set up, very large. If kept in knockdown, requires more space than wood box shooks, but less sizes.
(9) PRACTICAL SIZE. For most articles barrels are not the best size of package. This is one of the greatest disadvantages.
(10) PILING IN STORAGE WHEN FILLED: Barrels require 25 per cent more waste space as compared with rectangular packages. They cannot be piled high with safety.
(11) VALUE AS ADVERTISING DISPLAY. Practically none.
(12) EASE AND COST OF PACKING AND SEALING. Can only be packed by experienced help. In most cases the amount saved in original cost is more than lost in expense of packing and heading properly.
13. PROOF AGAINST PILFERING OR OPENING. Very difficult to close in any manner which will make pilfering either difficult or apparent.
(14) COST OF HANDLING IN STORAGE AND SHIPMENT. This cost is usually high per package as well as per unit of production.
(15) ORIGINAL COST OF PACKAGE. Very low per unit of production usually, owing to size.

Factors favorable to barrels are Nos. 1, 2, 3, 6, 7 and 15. If these outweigh other considerations the barrel may be considered seriously for packing.

The Wooden Box

The wooden box—or rather the box—for all substitutes for the wooden box are merely packages although sometimes referred to as "boxes." No other package combining all of the features of a box has as yet been invented. Wooden boxes have been used for centuries—so has glass. Some things which apply to glass manufacturers in regard to glass and its manufacture are also true of wooden boxes. Glass was until recently a mysterious mixture of several common substances to which of recent years have been added a few drops or grains of concentrated thought. So with the wooden box. Until recently a wooden box was a combination of lumber and nails but concentrated thought have been added to it also. Not however in as large doses as should be and not until its nose was held and the dose was given it from a large *paper spoon*. The wooden box industry was so deep in the rut of apathetic self-satisfaction that it had fatty degeneration of the ambition and hardening of the improvement arteries, but it has been awakened sufficiently to roll over and yawn.

Several freak and special styles of wooden boxes have been introduced, the only one to make much impression has been the "wire-bound" which has some field and is a legitimate competitor. It is better to consider the wire-bound box separately.

There are seven standard styles of wooden box construction that have become known to glass manufacturers. They can meet any requirement and will bear comparison with any other packages. In discussing the wooden box it is assumed that the proper style has been selected for each use and that the box has been properly constructed.

(1) STRENGTH. This can be accurately figured and designed with any desired "factor of safety" over that necessary as desired. The box has as yet no competitor in a fair comparison.
(2) RIGIDITY. This, too, may be designed and absolutely controlled. If price is not prohibitive the box has no competitor in this respect either.
(3) WATERPROOF. The box can be so made that it will withstand actual and long continued immersion in water. However, partial temporary waterproofing of a cheap box cannot be done as cheaply as in the case of some cheap substitutes.
(4) CAPABILITY OF ALTERATION. The box can be altered in any way desired before making up and in most cases can be taken apart and made over after making up. It stands alone in this feature.
(5) SAFE HANDLING. Made in sane and safe sizes, the only dangers are those caused by careless manufacture and closing, by protruding nails and loose ends of strap iron, if used.
(6) DETERIORATION IN STORAGE. Less than any other package over long periods. Moisture content of lumber is the determining factor governing shrinkage and warping. Few boxmakers or users provide any care whatever. If given reasonable care wood has no competitor.
(7) WEIGHT. Slightly greater than for other packages entailing a small percentage additional freight. For the amount of protection given, this difference is grossly exaggerated, except for very small units.
(8) BULK OF STORAGE SPACE EMPTY. Requires much in quan-

tity, but little in value. Cheap storage space with usually the poorest protection is afforded. Frequently stored fully exposed to the weather. Boxes should be stored with the same care as given to coal in storage.

(9) PRACTICAL SIZE UNIT OF PACKAGE. The box in one of the seven styles, properly designed, has the greatest range.

(10) PILING IN STORAGE FILLED. Needs no comment.

(11) VALUE OF ADVERTISING DISPLAY. Less than that of fibre packages, although metal type may be used. Only very expensive lumber presents printing surface comparing with fibre.

(12) EASE AND COST OF PACKING AND SEALING. Assuming proper interior packing is about equal on the average.

(13) PILFER PROOF OR EVIDENCE OF OPENING. The wooden box does not compare with either solid fibre or corrupated fibre package in this as they are practically pilfer proof, due to the method of sealing. No practical method has been devised to so seal a wooden box that it cannot be tampered with, except at prohibitive cost.

(14) COST TO HANDLE IN STORAGE AND SHIPMENT. A comparison based on unit of production packed and number of packages generally shows over all cost about the same, although wooden box enthusiasts might claim some lower cost.

(15) ORIGINAL COST OF PACKAGE. If this is the deciding factor the wooden box is unable to compete except in large sizes.

Factors favorable to the box: Nos. 1, 2, 3, 4, 6, 9, 10.

The Solid Fibre Carton

This package has not been largely adopted for glass for reasons readily apparent, although it is well suited for articles that are not so fragile.

(1) STRENGTH. Compares favorably if stitched properly, tears more readily, but resists puncture better than corrugated carton. Subject to crushing and deformation.

(2) RIGIDITY. Very poor in this respect. Requires the equivalent of a complete corrugated carton as extra interior packing to answer for glassware.

(3) WATERPROOF. Accomplished partially at no extra cost.

(4) CAPABILITY OF ALTERATION. About the same as corrugated fibre carton; can be reduced in depth, but not very satisfactorily.

(5) SAFE HANDLING. Very little danger of injury from metal stitching used. As highly desirable in this respect as the corrugated fibre.

(6) DETERIORATION IN STORAGE. Affected by climatic conditions and if exposed to light fades out in color and becomes unsightly. This happens especially in storage.

(7) WEIGHT. Less than wooden box, but more than corrugated carton, if proper amount of interior packing is used for glassware.

(8) BULK IN STORAGE PREVIOUS TO USE. About the same as for corrugated carton. Requires less space than wooden boxes even in shook form.

(9) PRACTICAL SIZE. Limited to smaller sizes only.

(10) PILING IN STORAGE FILLED. Very poor in comparison with other packages.

(11) VALUE OF ADVERTISING. Best surface for printing of any package in use—can be printed with either rubber or metal type.

(12) EASE AND COST OF PACKING AND SEALING. The most difficult to seal properly.

(13) PILFER PROOF OR EVIDENCE OF OPENING. Can be sealed so that pilfering is detected readily.

(14) COST OF HANDLING AND STORAGE IN SHIPMENT. About the same for all sizes and styles. Proper handling will result in practically the same cost per unit of production.

(15) ORIGINAL COST OF PACKAGE. Costs more than corrugated carton if provided with proper protection for glassware.

Factors favorable to the solid fibre cartons, Nos. 3, 5, 7, 8, 11, 13, 14 and 15.

Corrugated Fibre Carton

As a package for glassware the corrugated fibre carton is not an inferior substitute nor a competitor for the wooden box but an auxiliary supplying a long felt want, replacing the wooden box where it was least suited and opening a field which would not otherwise have been supplied.

The corrugated fibre carton meets conditions somewhat as follows:

(1) STRENGTH. Can be designed into it as necessary up to weight limit of economical convenient handling.

(2) RIGIDITY. Can also be provided by proper designing for most purposes and reasonable sizes.

(3) WATERPROOFING. Adequate under reasonable requirements.

(4) ALTERATION. Not very practical.

(5) SAFE HANDLING. Practically no danger of injury.

(6) DETERIORATION IN STORAGE. About the same as solid fibre.

(7) WEIGHT the least of any package providing equal protection.

(8) BULK IN STORAGE PREVIOUS TO USE. Very small by comparison with wood.

(9) PRACTICAL SIZE. Has been extended to include the largest convenient size package to handle where its cost begins to compare equally with the wooden box.

(10) PILING IN STORAGE. All things considered somewhat inferior to wood.

(11) ADVERTISING VALUE. Better than wood—inferior to solid fibre.

(12) EASE AND COST OF PACKING AND SEALING. This can be done in a very satisfactory method and economically per package. As generally used in smaller packages, however, the cost is proportional to number of packages and unit of production cost may exceed that for wooden box.

(13) PROOF AGAINST PILFERING OR OPENING. Can be sealed so that pilfering is almost impossible without being apparent.

(14) COST OF HANDLING IN STORAGE AND SHIPMENT. Enthusiasts over each style of package claim this factor. However, cost is largely a matter of method used. If the proper method has been chosen the costs are practically the same per unit of production, whether packed in small packages and handled quickly, or in larger packages handled slower, but moving more units per package.

(15) ORIGINAL COST OF PACKAGE. For the smaller packages of glassware the corrugated fibre carton is the cheapest and most satisfactory package.

Factors favorable to the corrugated fiber packages: Nos. 1, 2, 3, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15.

The fact that corrugated fibre boxes cannot be altered to suit the size of the article and the deterioration in storage are two factors that deserve serious consideration. The large number of sizes which must of necessity be kept available and the losses due to storage explain why the wooden box, excelling in these features will not soon be replaced even though its first cost is much higher.

Most of the reading matter available on the subject of packages is sales talk, written with a decided bias by the seller. Illustrations are chosen to prove that some particular style of package is superior and in most cases extreme illustrations are used. The glass manufacturer in choosing his packages should analyze his own product and conditions, then consider what each style box or package offers and decide how his ware may best be packed and sold. Enthusiasts over each style or those promoting the sale of each will naturally become loud over its virtues and correspondingly reticent over its weaknesses. As a matter of demonstrated fact each style package has its own proper field in which it is the logical choice, but each may be misrepresented pro and con.

When the fibre carton first made its appearance it was proposed for service before it had been properly adapted to the purpose for which it was presented. After its use had become more general it has served to stimulate improvements in the barrel and wooden box.

The fibre carton has not rendered inferior service and disrupted the distribution of goods as was feared by the friends of the wooden box. It has replaced inferior wooden boxes with better service and at a cost with which even the flimsiest wooden box could not compete. It has served to open up additional fields which otherwise would have been

left unserved. More wooden boxes are used today than before the fibre carton made its appearance but the shipping today could hardly be handled with the wooden box alone. Each has its proper field.

Corrugated fibre cartons are made in several different styles for various purposes but only two styles need be considered for the greater number of glass packages; namely, the one-piece or slotted carton for larger and the two or three-piece telescope or slide for smaller packages. Subject to the rules and specifications of carriers the necessary weight and grade of material for known commodity and weight of contents will be supplied by any reputable manufacturer with his guarantee stamp thereon stating that the package complies with those specifications. The glass shipper need only be cautioned that for best results he should divide his packages in somewhat smaller units than the maximum permitted and over-do the matter of sealing rather than risk under-sealing. He may also profit by the recommendation of the Forest Products engineers as made in one of their publications to make liberal use of adhesive tape in sealing. This adds to the strength of the package at corners and seams out of proportion to the small additional cost. The choice of outer carton is easily made but considerable thought should be given the internal packing. As the fibre carton cannot compete successfully with the wooden box above a certain size and weight, the styles also are limited. This is not true of the wooden box as heavier larger packages are better served by the wooden box.

When first introduced fibre cartons were discriminated against by carriers, and shipments in them were penalized by higher freight rates on the assumption that more care and expense in handling were necessary on the part of the carrier, together with more liability and consequent claims for damage in transit. Such has not been the case where the package was properly adapted and the reverse has actually been the case of claims. Under average present conditions the fibre carton does not have to ask for exceptions. The days of freight standing on open platforms in the rain is history. It should also be mentioned that we are prone to overlook, or perhaps not to appreciate the consideration that is given to packages marked "Glass—Handle with Care."

An impartial observation will satisfy anyone that as a rule breakage is in spite of care in handling and not for lack of it, and that the genus Freight Hostler is very much inclined to be a real friend of glass manufacturers and shippers. The fibre carton usually carrying this request conspicuously printed on top has helped to demonstrate this.

The shipper of glass ware must of course choose packages which comply with specifications to be acceptable to carriers. As previously mentioned these are not exact descriptions of the best practice but define practical limits and not too arbitrary at that. Briefly stated one should not approach weight limits too closely for fibre cartons and should exceed interior protection prescribed for wooden boxes for safe delivery of contents.

The association of manufacturers of the material maintain a research and service bureau which will be pleased to furnish advice on this subject in addition to the suggestions of the individual sales service of each firm.

Any one interested may obtain full information and the benefits of extensive research work by addressing National Container Association, 608 South Dearborn Street, Chicago. The United States Forest Products Laboratory, Madison, Wisconsin, also has several publications for distribution on fibre cartons as well as wooden boxes which should be obtained. The National Association of Box Manufacturers, 844 North Rush Street, Chicago furnishes information relative to wooden boxes.

The information from above sources should be considered by the glass manufacturer as subject matter for further consideration in the analysis of his own conditions, not taken as a patent medicine.

Future of Glass Bottle Industry Discussed at Meeting of Society of Glass Technology

The first meeting of the Society of Glass Technology for the session 1925-26 was held in Sheffield, England, on October 21, when the president, T. C. Moorshead, delivered an address on "The Glass Bottle Industry and Its Future Developments."

At the outset, Mr. Moorshead pointed out that the comparative lack of definite knowledge of the structure and characteristics of glass and the means of controlling its manipulation with absolute certainty had to a large extent retarded the development of the mechanical phases of the industry. Yet the last quarter of a century had seen practically a complete revolution in the manufacture of glass containers, and this period formed one of the most important epochs in the history of the glass bottle industry, economically, scientifically and commercially.

About 1900, two ideas, totally different in principle, suddenly blossomed forth. One was Homer Brooke's idea of feeding a machine with a stream of glass flowing by gravity from the furnace. The other was the application of the suction principle in feeding the machine, a process developed by M. J. Owens. From this time progress in the development of mechanical devices for glass manufacture had been rapid. With the development of automatic processes there had come a very great improvement in the character of all of the auxiliary plant and equipment, with the result that today many bottle manufacturing plants were practically mechanically operated throughout.

Future developments in the gravity process and in the suction process depended on different factors. The success of the suction process lay in its application to mass production, but it was not economically adaptable to the smaller units. With the gravity flow process it should be possible, on account of the comparatively simple auxiliary plant required for feeding, to produce articles more economically and at the same time to obtain the desired flexibility of operation.

Experimenting With Powdered Batch

After dealing briefly with lehrs, including "heatless" lehrs, Mr. Moorshead went on to discuss furnace design, a subject which had been very much neglected. Properly co-ordinated research work, exploring the problem thoroughly, would no doubt be rewarded with valuable information. In the firm belief in the feasibility of the principle of feeding and melting the batch at the same time, and with a view to blazing the trail for future and more extensive research work, the United Glass Bottle Manufacturers, Ltd., were arranging to finance some experimental work based on the principles outlined by Alexander Ferguson, and described to the Society of Glass Technology in May, 1923. Details of the proposed experiments were given; the theoretical advantages claimed for the new process being (1) smaller radiating surface per ton of furnace melting capacity, the ratio being approximately 2 to 1; (2) more intimate contact between the flame and the constituents of the batch. The first mentioned, however, depended upon (a) the feasibility of melting the batch when pulverized and fed into the furnace in fine powder in the short time of passage through the flame; (b) the corrosive effects of the stream of melted glass on the side walls of the funnel-shaped melting chamber, as well as the effect on the glass itself.

Still further research was necessary to discover a formula from which it would be possible to produce a glass with more stable characteristics than that with which they had to deal today.

Glass Chipping

By Walter Smith*

The glass industry, in common with the majority of industries, has grown and is being modernized by the application of improvements and advances gained in other lines of manufacturing.

An interesting development in the plate glass industry is the use of city gas as a fuel for the making of chipped glass. For many places where light is desired without permitting vision, such as partitions for private offices, corridors, doors leading to private rooms and for uses of a purely ornamental character, glass with various kinds of patterns on its surface is required.

The modern glassmaker has at his command a number of simple processes which enable him to produce results that are very attractive, which in the earlier days of the industry would have required much labor and expert craftsmanship. The use of gas has made possible many improvements in processes. Gas is used extensively in the production of chipped glass.

The first step of this process is to roughen the surface of the glass by means of the sandblast. This is done for

OVEN FOR DRYING LAYER OF GLUE

the purpose of making the coat of glue, which is subsequently applied, adhere firmly to the glass. The layer of glue is allowed to dry and then subjected to gradual heating. This is done in an oven which is carefully and gradually heated by means of gas flames.

The heated air is delivered to the bottom of the dryer by a fan, and is further distributed to the different parts of the dryer by a series of double baffles.

At this point advantage is taken of the natural properties of glass and glue. Gradual heating contracts the coat of glue on the glass and as it dries causes it to shrink and shrivel off in flakes, each flake taking off with itself a thin piece of the glass to which the glue is so firmly attached that the glass cannot resist the tensile force exerted by the shrinking glue, and goes with it, leaving a delicate tracery pattern on the glass surface. No two flakes of glass will peel off exactly alike and this makes the haphazard pattern entirely different from work done by mechanical means.

The equipment used in the case here illustrated is a 30-inch rotary fan connected to a hot air generator. The latter consists of sixty-five 1¼-inch seamless tubes which

HOT AIR GENERATOR AND 10-INCH EXHAUST FAN

are heated with gas. The air is rotated by an exhaust fan.

The temperature of the air is about 120 degrees Fahrenheit. This temperature is reached in the course of twenty minutes. The complete operation consumes 10 to 12 hours time. By repeating the sand blasting and chipping operations on a sheet of glass already chipped, a still more beautiful finish is obtained.

With this equipment ten thousand square feet of chipped glass can be produced in a month. The gas consumption amounts to approximately fifty thousand cubic feet.

* Consolidated Gas Company of New York.

Blue Glass for Furnace Work

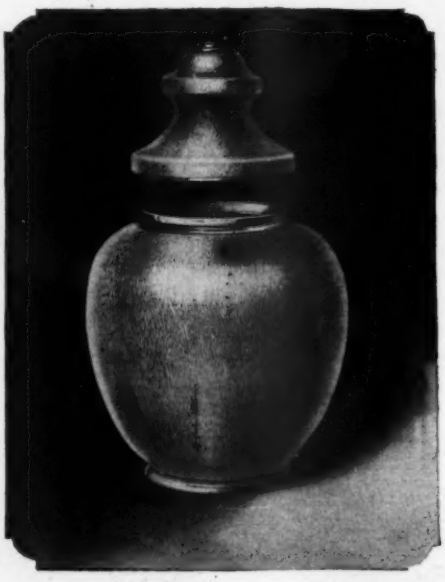
A blue glass which will absorb the ultra-violet rays has been developed by the Bureau of Standards for protecting the eyes of furnace workers. Safety engineers have insisted that men working around high-temperature furnaces use a brown glass which reduces the intensity of the light from the furnace and also offers good protection against the ultra-violet rays. However, the furnace operators themselves prefer a blue glass regardless of the fact that it only gives partial protection against the ultra-violet rays, maintaining that they can observe furnace conditions better through a blue than through a brown glass. This prejudice is probably due to their greater experience with a blue glass, because brown glasses are now being extensively used with satisfactory results in some industries.

The blue glass recently made at the bureau has, in addition to the color and other desirable properties of the ordinary blue glass, the very desirable property of furnishing protection against the ultra-violet rays. The glass can be made by replacing about half the lime in a soft soda-lime glass with cerium oxide and adding sufficient cobalt oxide to produce the desired color.

Modern Street Lighting Glassware

How the General Electric Company's Globes and Canopies Are Made

The satisfaction given to the observer by an installation of street lighting depends to a great extent upon the type of glassware used. Clear plain glass, with its many faults, has been definitely ruled out and several factors now enter into the selection of the proper glassware. The most important of these are suggested in the following questions: *Form:* Has it a pleasing appearance when lighted? Does it harmonize with the fixture to which it is attached, and also with its surroundings? In other words, is it correctly designed from the artistic standpoint? *Surface Texture:* Is the surface so designed as to give a sparkling, lively tone to the light, or has it a flat, dead quality? *Diffusion:* Does the glassware reveal the light source as a bright, glaring spot, or as a diffused area extending over the entire surface of the globe, completely preventing eye strain? *Maintenance:* Is the globe tough and strong, able to withstand hard service and the elements, or is it fragile and easily broken by exposure? That is, is it carefully manufactured? Moreover, does it collect dirt, and is it easy to clean?



The impetus recently given to ornamental street lighting has demanded both artistic and practical glassware, and earnest efforts to meet that demand have been rewarded with success.

Street lighting glassware may be a source of civic pride or the subject of public derision. An artist may design magnificent globes and lanterns, but the units must be highly efficient; they must not waste light and hence the tax-payers' money.

They must be constructed for architectural beauty as well as utility and artistically designed to harmonize with the ornamental standards or brackets on which they are mounted. Various kinds of glass are available so that at least one can be found which is exactly applicable to the given set of conditions. Globes must present an artistic appearance in the daytime when they are seen as only a part of the lighting fixture; while at night, when they become centers of interest, they must create an equally good impression.

In making the globes the glass blower thrusts the end of a six-foot steel blow pipe into the furnace containing molten glass, turning the pipe continually and gathering as much material on the end of it as is necessary. By blowing through the pipe, pressure is exerted upon the inside of this ball of glass, and a hollow globule is formed. This globule is slowly revolved until its walls are of about uniform thick-

FIG. 1. SMOOTHING THE OUTSIDE SURFACE OF THE GLASS GLOBULE WITH WOODEN FORMS

FIG. 2. REMOVING THE GLASS GLOBULE FROM THE FURNACE AFTER ABOUT FOUR GATHERINGS

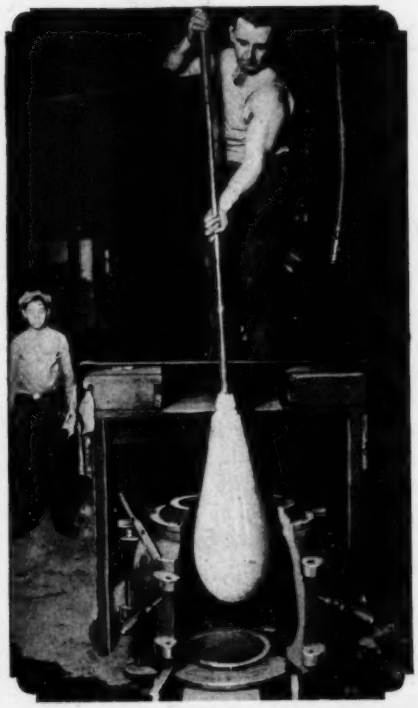


FIG. 3. PLACING THE GLOBULE IN THE MOLD

ness, while its outside surface is smoothed by use of wooden forms as illustrated in Fig. 1. The globule is built up to the desired size by repeated gatherings of the molten glass, expanding it by blowing, and smoothing it off. Fig. 2 shows the globule being removed from the furnace after about four gatherings. When the required size is reached, it is placed in the mold, as shown in Fig. 3, the mold is then clamped shut, and air is applied to the globule to force it into the shape of the mold. When the glass has solidified sufficiently to retain the globe shape, it is taken out of the mold. In Fig. 4 the globe is being removed from its mold.

After the glass has been formed into the desired shape, it is placed on an endless belt, which moves slowly through an annealing oven of considerable length. The annealing tends to relieve all strains and internal stresses in the glass and also removes most of its brittleness.

When the globe shapes are taken from the annealing oven or lehr, the ends are cracked off, leaving only the globes. This is accomplished by placing the globe shape, with its axis perpendicular, on a revolving table. A small gas flame is then impinged against

FIG. 4. REMOVING THE SHAPED GLOBE FROM ITS MOLD

FIG. 5. MOLD FOR GLOBE, CLOSED

Fig. 6. The operator is scratching the lower hot ring with a piece of carborundum.

When the ends have been cracked off, the edges are ground smooth on a large revolving iron wheel, placed with its axis vertical, sand and carborundum dust being used as a grinding flux. Workmen can be seen in Fig. 7 grinding the edges of a canopy and two globes. This completes the manufacturing operations and the globes are ready for packing.

FIG. 6. WORKMAN CRACKING OFF THE OVERBLOW FROM A GLOBE

the globe at the point where the superfluous glass is to be cracked off. As the globe is turned on its revolving support, a narrow ring of the glass is heated. When this ring is hot enough, it is scratched slightly with a piece of carborundum. The scratch causes the glass to crack, the crack following the hot ring all the way around the globe, separating it from the end-piece or overblow. The globe is shown on the cracking-off table in

FIG. 7. GRINDING THE EDGES OF GLOBES AND A CANOPY

The Laboratory

By J. B. Krak

The Valuation of Borax and Boric Acid

The increasing use of borax and boric acid in the glass industry makes these materials of special interest to the glass chemist. Boron may be introduced into glass in the following forms:

1. Common or prismatic borax, $Na_2B_4O_7 10H_2O$, containing 16.2% sodium oxide, 36.6% boric acid and 47.2% water,
2. Boric acid, H_3BO_3, containing 54.8% boric acid and 45.2% water.
3. Calcined borax, $Na_2B_4O_7$, containing 30.8% sodium oxide and 69.2% boric acid.
4. Octahedral borax, $Na_2B_4O_7 5H_2O$, containing 21.2% sodium oxide, 47.9% boric acid and 30.9% water.
5. Water free boric acid, B_2O_3.

Common borax and boric acid are used most generally in glass making. Borax is a much less expensive way of introducing boron than boric acid as may be computed as follows:

One pound of borax with 36.6% B_2O_3 costs 5 cents, therefore 1 pound of B_2O_3 as borax costs $\frac{5}{.366} = 13.6$ cents.

One pound of boric acid with 54.8% B_2O_3 cost 9 cents, therefore 1 pound of B_2O_3 as boric acid costs $\frac{9}{.548} = 16.4$ cents.

This makes a difference of 2.8 cents per pound of B_2O_3 introduced in the glass. In addition there is the advantage of introducing sodium oxide in the batch which replaces that added as soda ash.

For these reasons borax is preferable, unless the addition of sodium oxide would be detrimental to the properties of theglass, as for instance in some thermometer glasses.

Analysis of Borax

Dissolve ten grams in about 300 cc. of water, free from carbon dioxide. Dilute to 500 cc. in a graduated flask and mix well.

The procedure is based on the fact that boric acid is neutral to methylorange but is acid to phenolphthalein. Therefore the combined and free alkali of the sample can be titrated, using methylorange as an indicator.

One hundred cc. of the solution of the sample, representing 2 grams, are pipetted into a beaker. A few drops of methylorange are added and the solution is titrated with normal sulphuric acid until the yellow color changes to an orange red.

Reaction:

$$Na_2B_4O_7 + H_2SO_4 + 5\,H_2O = Na_2SO_4 + 4\,H_3BO_3. \quad (1)$$

1 cc. N/1 H_2SO_4 = .031 gram Na_2O.
1 cc. N/1 H_2SO_4 = .1911 gram $Na_2B_4O_7 10H_2O$.
1 cc. N/1 H_2SO_4 = .101 gram $Na_2B_4O_7$.

If free alkali is known to be absent this titration gives the amount of borax direct.

If it is desired to ascertain the amount of boric acid present in borax, this can be done by first liberating the boric acid by addition of normal sulphuric acid in exactly the amount as found by the previous titration. The boric acid can then be titrated with normal alkali solution using phenolphthalein. However, it is impossible to obtain a good endpoint. The first rose color appears before all of the boric acid is neutralized, due to hydrolysis of the sodium metaborate formed. To prevent this, it has been suggested by Jörgensen[1] to add glycerol. If an insufficient quantity has been added the rose color appears too early, and can be made to disappear by further addition of glycerol. The procedure is as follows:

To 100 cc. of the solution of the sample, add the amount of alkali found necessary to liberate the boric acid as per equation (1). Then add 50 cc. glycerol, some phenolphthalein and titrate with normal sodium hydroxide until the characteristic purplish pink color appears. Add more glycerol and if the color fades continue the titration until the endpoint no longer disappears upon addition of glycerol.

Reaction

$$H_3BO_3 + NaOH = NaBO_2 + H_2O. \quad (2)$$

1 cc. N/1 NaOH = .062 H_3BO_3.
1 cc. N/1 NaOH = .0505 $Na_2B_4O_7$.
1 cc. N/1 NaOH = .0955 $Na_2B_4O_7 10H_2O$.

If borax is free from excess B_2O_3 or Na_2O the acid titration is exactly one-half the alkali titration. If the acid titration exceeds this proportion it indicates that free alkali is present. If the alkali titration is more than twice the acid titration, free boric acid is present.

Glycerol often contains free fatty acid, which would be titrated with alkali. Therefore glycerol should be made neutral before use.

Mannitol or mannite, $C_6H_8(OH)_6$ is often used in preference to glycerol. It is added as a solid and therefore does not appreciably increase the volume of the solution to which it is added. It gives a sharper endpoint and is usually free from acid.

Valuation of Boric Acid

One hundred cc. of the solution prepared as directed for borax is heated with 50 cc. glycerol or 1 gram of mannitol. Phenolphthalein is added and the solution is titrated with normal sodium hydroxide, as described above.

1 cc. N/1 NaOH = .062 boric acid, H_3BO_3.

Factors:

Na_2O to $Na_2B_4O_7$ = 3.2581, reciprocal = .3069.
Na_2O to $Na_2B_4O_7 10H_2O$ = 6.1638, reciprocal = .1622.
Na_2O to Na_2CO_3 = 1.7097, reciprocal = .5849.

[1] *Zeitschs. f. Angew. Chem.* 1897.5.

The Tariff Investigation at Washington

Inquiry Into Cost of Production of Plate Glass and Mirror Plate

The public hearing before the United States Tariff Commission in connection with the investigation now being made into the costs of production of plate glass and mirror plate opened at Washington on Monday, November 23.

Commissioners Marvin (chairman), Dennis (vice-chairman) Costigan, Glassie, Baldwin, Brossard and Secretary John F. Bethune were present.

Participation in the proceedings was open to all interested persons and the following individuals representing various interests appeared:

David J. Gallert, of Gallert, Hilborn & Raphael, New York, appearing for Association of Foreign Glass Consumers.

Francis D. Campau, Grand Rapids, Mich., appearing for Furniture Manufacturing Association of Grand Rapids.

John R. Rafter, New York, appearing for Lucien De Bay, Auvelais, Belgium, and Paul Lhoest, Moustier, Belgium.

Harry C. Sorden, Shelbyville, Ind., appearing for Mirror Manufacturers Association.

Messrs. Darby, Presmont and Swope, Washington, D. C., appearing for American Plate Glass Corporation.

P. J. McCumber, and H. Brand, Jr., Washington, D. C., appearing for Pittsburgh Plate Glass Company.

Royal T. McKenna, Washington, D. C., appearing for National Plate Glass Company, Edward Ford Plate Glass Company and Standard Plate Glass Company.

Among others present were H. J. Eckenrode, president, National Plate Glass Company; H. S. Wherrett, vice-president, Pittsburgh Plate Glass Company; J. Roy Helm, sales manager, Edward Ford Plate Glass Company; A. H. Gaffney, president, American Plate Glass Corporation; Frank E. Troutman, president, Standard Plate Glass Company; J. Vaurie, United States representative of the Societe de Saint-Gobain, France; W. A. Michiels, representing the Union Commercial des Glaceries Belges; A. Solomon of L. Solomon & Son, New York, importers and mirror manufacturers; H. P. Higgins, sales manager, Pittsburgh Plate Glass Company, and R. L. H. Donald of Pilkington Bros. Co., St. Catharines, Canada.

The Chairman opened the meeting, calling attention to the fact that the figures presented in the Statement of Information[1] issued recently by the Commission were preliminary and tentative and were submitted for comment, analysis and criticism.

Witnesses on behalf of the applicant, Buckley-Newhall Company, New York, for reductions in duties on plate glass, were then heard. Part of the testimony, very much abridged and with many omissions is given below.

DAVID J. GALLERT took the stand and stated that the members of the association he represents import about 65 per cent of the plate glass brought into this country. He said the most important parts of the Commission's statement was that relating to costs in the United States and Belgium, the principal competing country.

He said:

The situation is that the figures for the American costs were procured in the year 1922 and the first quarter of 1923. Your Honors, a tremendous change has taken place in this industry since these figures were collected, a change that is nothing short of revolutionary, a change that, admittedly, reduces the cost of production 30 per cent, and we have information to the effect that the process has been so improved that it has carried the reduction to a very much greater length and degree.

In 1919 we had a scarcity of plate glass, and it was very difficult to obtain it at the time. We understand that the Ford Motor Company had tremendous difficulty in getting it, and we have been told that its production was so limited that it had made open cars when it desired to make closed cars.

In consequence of this it experimented and produced this so-called new process of continuous flow.

The Libbey-Owens Company have developed a process to draw ordinary glass in flat form, and very much along the same lines. They conceived the idea and began successfully to make this drawn window glass in 1916. After a while, they did not see why they could not make plate glass in that same way, and they erected a plant for that purpose, a grinding and polishing plant, and in May or June of this year succeeded by their method in turning out plate glass by this process.

Henry Ford, or the Ford Motor Company, first erected a small plant. I think its capacity when first opened was 1,250,000 feet, early in 1923. Our information is that he enlarged the capacity of this plant until it was 3,400,000 feet. Hardly was it finished when he began to erect another one. The first one was at Highland Park, Detroit. The second one was erected at River Rouge, Detroit, with a capacity of 10,000,000 feet. That plant was finished in the middle of 1924.

The Libbey-Owens plant which I have referred to we are informed has a capacity of 15,000,000 square feet.

In the mean time, the Pittsburgh Plate Glass Company, aware of this process, erected a plant with a capacity of 10,000,000 square feet, at Creighton, Pa. According to the annual report of that company, that plant was finished in 1924 and it had already begun to erect a second unit. That unit was to have a capacity, according to the public press, the trade press, of 10,000,000 more square feet. It was to be erected in sections, and undoubtedly part, if not all, of that plant is operated at the present time.

In addition, Henry Ford has under construction another plant to make glass by this process at St. Paul, Minn.

We therefore have a capacity at the present time, under this new process, of 15,000,000 square feet at the Libbey-Owens plant; of 13,400,000 square feet in the two Ford plants, and a capacity of 20,000,000 at Creighton, Pa., as well as the new plant of Henry Ford under construction.

And I may say that that is all small glass, so you see that that gives us a total capacity of 48,000,000 at the present time, with 10,000,000 more under construction, out of the possible production of 78,000,000 square feet of the small glass in this country.

We believe, may it please the Commission, that the introduction of this revolutionary process, declared revolutionary throughout the trade press, is such and has such effect on the industry as to render the figures that are published in the preliminary investigation, being the figures for the year 1922 and the first quarter for 1923, obsolete.

Of course we know that it is the desire to find out the difference in cost. These figures are based on the average cost; and when you have such a tremendous portion of the production produced by a system which does produce it at anywhere from 30 to 60 per cent less, it is obvious that these figures are unreliable and not safe for anyone to proceed on at the present time.

Asks Adjournment

Our request is that the Commission adjourn this hearing and ascertain new figures on the new basis, and then we can all be in position to consider the question with proper data; but at the present time the figures in these data are absolutely inaccurate.

In addition to the decrease in cost which the Commission we think no doubt will find from this new process, we believe that there is a tremendous increase in volume of production and of

[1] Published in full in November issue of the GLASS INDUSTRY.

sales 76,000,000 square feet, I believe, in 1922, and it has amounted to approximately 120,000,000 for this year.

Of course it will be clear to this Commission that with such a tremendous increase in volume there would be a big reduction in administrative expense in well managed concerns, and no one can possibly deny that the Pittsburgh Plate Glass Company, the General Motors and the Ford Motor Companies are certainly well managed concerns.

This tremendous decrease in cost is corroborated by the great increase in American earnings, jumping anywhere from earnings of $13,000,000 to $24,000,000, $18,000,000; stock dividends of 30 per cent; stock dividends of 56½ per cent. One company whose stock cost $100, in three years sold for $750—and so on, all through the industry.

MR. GALLERT proceeded:

And that brings us to the answer to the first question asked by the Commission—different duties.

Of course there should be different duties, because smaller sizes are being produced at a less price than the larger sizes owing to difference in the process and, in addition, because the selling prices which are fixed by the American companies are so low that if you add to it a duty of 17½ per cent which is reflected by this statement, you make it absolutely prohibitive.

The American price list, as I remember it, starts at 18 cents. Obviously a duty of 17½ cents per square foot makes that impossible. So, when you add the duty, plus cost of transportation, plus extra packing on the imported glass, you will find that if a duty of 17½ cents is published you practically make all foreign importations impossible.

That, of course, we are going to submit to the Commission, would be extremely unfortunate, because in 1919 and 1923 we had a scarcity of plate glass, the effect of which was to hamper both the automobile industry and the furniture industry, and as a result of which some of the automobile companies bought or erected their own plate glass factories. We are practically up to our capacity, or within a very short amount; and at the present time I am informed that cash premiums are being paid for immediate deliveries in New York.

Of course, if you have that scarcity, if you have that demand for glass, you have furniture held and not being shipped today for the lack of mirrors, and you have the automobile production hampered.

In addition to that, the situation in this industry is extremely open to a monopoly, because if you exclude the glass companies which are owned by the automobile companies—and they are crying for plate glass—you have over half of the amount of glass produced by one company, and you have in existence a manufacturers' association which gives out the statistics of the trade and maintains two offices; and we want to submit that imported glass is not competitive with the domestic glass, because the automobile manufacturers will not buy foreign glass when they can get domestic, on account of the time it takes, turnover being especially emphasized in their trade.

It is our theory, as I stated at first, that the Preliminary Statement under present conditions is now inaccurate on account of the new process, on account of the increase in volume, and because the preliminary statement figures the cost to Chicago, whereas, as a matter of fact, about 50 to 53 per cent, I am informed, of the glass used is used in the automobile trade which makes Detroit the big market.

Your Honors, much of what I have said is very well known in the trade and is reflected in the trade journals. I have a file here of the GLASS INDUSTRY, one of the representative magazines, reflecting much of what I have said, which I would like to mark in evidence, calling attention to particular paragraphs.

But, first, I would like to mark in evidence a paper read by Mr. Fox, the executive engineer of the Pittsburgh Plate Glass Company. There was a convention of automotive engineers held in Detroit in October, and Mr. Fox gave an extremely important statement of the difference between the old process and the new process, and he has set out in much greater detail what I attempted to give the Commission in my opening, and it shows the savings in operation of the new process.

Objection by MR. PRESMONT was made to admitting the Fox article in evidence on the ground that the foreign concerns, with the exception of an American concern in Belgium, refused access to their books by a duly accredited representative of this Commission. "He who comes into Equity must come with clean hands." For that reason, he said, no evidence should be received at this time before this Commission on behalf of this foreign concern.

MR. MCKENNA and MR. RAFTER also protested emphatically. After considerable argument, COMMISSIONER GLASSIE proposed that a witness be sworn who could offer any paper he thought relevant or competent. W. A. MICHIELS, agent for Union Commercial des Glaceries Belges, was sworn and after another long period of wrangling, the document was admitted, as was also a second article discussing the same subject.

MR. MCKENNA called attention to the fact that this so-called new method of continuous manufacture is not common to American manufacture alone; it is quite prevalent in Europe.

MR. GALLERT then offered further exhibits:

Q. I show you a book and ask you what it is. A. It is a copy of the GLASS INDUSTRY.

Q. Volume 4? A. Yes, sir; for 1923.

Q. What is it? A. It is a well known paper relating mainly to glass and to the glass industry.

Q. A recognized trade journal in the glass trade? A. It is a recognized trade journal.

Q. On page 1 is there an article describing the first Ford Motor plant? A. There is such an article.

MR. GALLERT: I offer that article in evidence, describing the first of the Ford plants.

Q. I have shown you Volume 4, 1923 of GLASS INDUSTRY. What is this? A. It is Volume 5 of the GLASS INDUSTRY for 1924.

Q. What are these eleven volumes? A. These are eleven numbers in 1925 of the same journal.

MR. GALLERT: I offer the GLASS INDUSTRY for 1923 and 1924, and the eleven monthly numbers for 1925.

The documents referred to were received in evidence.

MR. GALLERT: I call attention to Volume 4, January, 1923, page 1, being a description of the first Ford Motor plant, being the first plant in this process.

I call your attention to Volume 5, being page 103, a description of the Libbey-Owens plant; the number for January, 1924, describing the Libbey-Owens plant; also the number for July, 1924, page 122, describing the Rouge River plant.

I call attention to the volume for 1923, page 18, describing the new Creighton plant of the Pittsburgh Plate Glass Company.

The volume for 1923, page 140, announcing the Libbey-Owens plant:

Volume 5, page 15, announcing the Libbey-Owens plant.

Volume 5, page 74, with the announcement of the Pittsburgh Creighton plant.

The volume for 1924, page 36, announcing completion of the second Ford Motor Plant.

1924, page 55, reporting plans for the Libbey-Owens plant.

Volume 5, 1924, page 103, describing the Libbey-Owens process.

Volume 5, page 117, announcing the completing of the second unit at the Creighton plant.

Volume 5, page 122, describing the River Rouge plant.

Volume 6, page 132, showing that the Libbey-Owens plant had begun operations.

The number for January, 1925, page 9, illustrating the Ford River Rouge plant.

The number for July, 1925, page 158, the new Ford plant.

April 25, page 89, approval by the Pittsburgh Plate Glass Company of plans of its new unit at Creighton.

September, 1925, page 207, plans being perfected for a new plant.

Volume 6, page 268, showing the first furnace of the new Ford plant at St. Paul is under construction.

January, 1925, page 17, showing the Libbey-Owens new plant.

October, 1925, showing the Kittanning Corporation and its purchase of ground for the purpose of operating the new process.

MR. MCKENNA: The objections interposed by Mr. McCumber to exhibits 1 and 2 apply equally well to these exhibits now before the Commission, and I also desire to interpose a particular objection to the statements shown in the January, 1923 number of the GLASS INDUSTRY, page 17, wherein production costs in the Belgian plate glass industry are set forth. I want to make it particularly emphatic in connection with that one page and all similar statements concerning production costs in the American and foreign industry.

MR. GALLERT: I did not refer to those productions and I am willing that they be not referred to here.

MR. MCKENNA: Then is the Commission to understand that these exhibits which you are introducing and have introduced are submitted solely for the purpose of showing the changes in the art without regard to cost figures of any kind?

MR. GALLERT: For the purpose of showing the change in the art without regard to production figures, and I will enumerate some references later on during the proceedings.

MR. MCKENNA: Are they submitted for the purpose of showing cost figures, both domestic and foreign?

MR. GALLERT: They are not submitted for the purpose of showing cost figures.

MR. MCKENNA: These statements submitted in these exhibits, notably one in April, 1925, issue of the GLASS INDUSTRY, show the annual reports of certain companies.

MR. GALLERT: And so far as concerns the annual reports I am not willing that my concession shall apply. I think the Commission should have the references to the annual reports before it.

I want to mention the volume of 1923, page 18; volume of 1923, page 19; volume of 1923, pages 127, 152 and 159, showing the redoubling in improvement and the rebuilding of American plants; the GLASS INDUSTRY, Volume 5, page 124, showing the corporation and projection of a new plant in Pennsylvania by the parties which sold the Durant plant to the Durant people, and the volume for 1925, page 132, and Volume 6, of July, page 158, showing the National Company had begun operation in its new plant with an additional capacity of 15,000,000 feet.

MR. MCCUMBER: Q. Have you any personal knowledge as to whether these new methods of manufacture are equally available to the foreign manufacturers as they are to the United States? A. I am not a manufacturer and I am not posted on those things.

Q. And you, as I understand, have no knowledge whatever as to whether this new method has materially decreased the cost of production? A. I have not.

MR. GALLERT: In regard to the volumes already marked in evidence, may I call attention to and including in the exhibits July, 1925, page 158, May, 1925, page 113, in regard to the change in American prices, and in July and August of this year, and the necessity for same, the condition of the trade as shown in July, 1925, page 158, May, 1925, page 113, and September, 1925, page 209.

Foreign Plate Glass Associations

MR. MCKENNA: Q. Is the Belgian Plate Glass Manufacturers' Association, of which you are agent, the selling organization of the International Glass Convention? A. No.

Q. What is it exclusive selling agent for? A. Of six Belgian plate glass factories who are members of the International Plate Glass Convention.

Q. Do they also sell through any agency of the International Plate Glass Convention? A. No, sir.

The witness was excused and ABRAHAM SOLOMON, of New York representing consumers of imported plate glass, was sworn.

A stockholders' report of the Pittsburgh Plate Glass Company, dated March 10, 1925, was admitted in evidence and also a printed prospectus of the Kittanning Plate Glass Company, now in process of organization. The latter caused a lengthy discussion and objections on the ground that a prospectus gotten up to sell stock could scarcely be relied upon, in fact was worthless for determining production costs, but it was finally admitted in evidence, as were also current price lists of various plate glass manufacturers and other documents, including a copy of the *National Glass Budget* of November 21, 1925, containing a speech by H. S. Wherrett, and a copy of *The Glass Worker* of October 24, 1925. Objections were made to certain exhibits on the ground that they related to earnings, not costs, and that the Commission had not said anything in their report about earnings.

MR. RAFTER: We submit that the investigation, so far as it relates to the Belgian cost of production, is confined to an investigation of one Belgian company for a period of two months during the year 1923, because the other data embodied in your summary relating to costs of production of Belgian companies are arrived at by an inverted method of calculation, which does not take into consideration the earnings of the company. I am inclined to agree somewhat with counsel's position, but I want to point out this fact at this time.

MR. PRESMONT: I just expected something like that. That is certainly a remarkable exhibition of the stand taken by the exporters. They come in here and, because the Commission itself has used the only means for determining the cost of foreign production, say to this Commission in effect that while they refused the agent of this Commission the opportunity of examining their books for the purpose of determining their cost, they now object to the determination reached by the Commission as to their cost because it is based upon earnings.

MR. SOLOMON explained, as he understood them, the differences between the old and new methods of making plate glass and how savings were effected by the new method. The Chairman inquired whether there is anything in the continuous process to prevent it being used in foreign countries but MR. SOLOMON did not know. He stated that an official of the Ford Motor Company had mentioned to him that the saving effected by their new process was approximately half the cost of manufacturing by the old method, while another official put it at 40 to 50 per cent. Asked what plants employ the continuous process, he cited the Ford Motor Company, Highland Park plant, with a capacity of 3,500,000 square feet, Ford Motor River Rouge factory, capacity 10,000,000 feet, and a new Ford factory under construction at St. Paul which is expected to be in operation early next year with a capacity of 10,000,000 square feet. Also the Libbey-Owens plant, 15,000,000 feet, and Pittsburgh Plate Glass Company with estimated capacity of 25 to 30 million square feet.

He said the Ford Company sell part of the product of their Glassmere plant, where the old process is used, and use the remainder themselves. They use all the Highland Park and River Rouge production except small sizes which they cannot use themselves and sell. He stated that at one time they could not obtain their full requirements of plate glass and had to use substitutes.

THE CHAIRMAN: Q. You have cited two reasons, one that they could not get the glass, and the other that by making it themselves they could get it produced at lower cost? A. Yes, sir.

Q. You import and sell plate glass? Do you still sell to automobile manufacturers? A. Yes, sir.

MR. GALLERT: Q. Will the automobile manufacturers buy foreign glass when domestic glass is obtainable? A. No, I do not think so.

Quality of Foreign Glass

COMMISSIONER COSTIGAN: Q. From the viewpoint of automobile users, is the imported article regarded as superior or inferior to the domestic article? A. Of the grade of glass which they purchase it is approximately the same. They buy what is known as glazing quality, with the exception of a few companies, we will say, such as the Packard or companies making a high grade car; they want a better grade. They would buy mirror glazing or silvering, for example.

Q. In regard to serving the vision of the automobile driver accurately, s there equal serviceability in the imported and domestic glass? A. Identically the same.

MR. GALLERT: Q. Is there any relation between the price in this country of foreign plate glass and domestic plate glass of the same kind, size and quality? A. Invariably. Over the number of years I have watched the matter very closely, the foreign prices generally followed the domestic prices. In other words, the prices which the American manufacturers always fixed. They announce their prices, and usually within a week or ten days or something like that, the foreign manufacturers would make the price approximately the same.

Q. You mean, about the same after allowance for the duty? A. Taking into consideration, of course, the cost of the duty which we have to pay, and the freight, insurance, and so forth.

Q. Is there any difference between the price charged for the same class, kind or quality by the different American manufacturers? A. The price lists of course speak for themselves, which we turned in this morning. They seem to be copied one from another.

THE CHAIRMAN: Q. What is the system in Belgium? Are the prices for the six or seven companies which are in the manufacturers' Association, all the same, or are they different? A. The six factories of the Union Commercial have a selling agency in Brussels; that is, they are in the Union Commercial. These six factories have different names. They are located in a different part of Belgium, and they allow the Union Commercial to sell their product for them.

Q. Is it sold at a uniform price? A. The Union Commercial gives the price. We do not know anything about the relationship between the Union Commercial and their prices.

Questioned by COMMISSIONER DENNIS as to where a big concern like the General Motors Corporation buys its glass, Mr. Solomon stated that he thought it was obtained through the Fisher Body Corporation which controls the National Plate Glass Company, both concerns being subsidiaries of the General Motors Corporation. Asked if they still used imported glass, he admitted that his company had supplied them even in this year.

Small Sizes of Plate Glass

MR. GALLERT: Q. Is it a trade custom to sell smaller sizes of glasses at a smaller price? A. Yes, sir. As far back as I can remember, as far back as I have asked a number of people, and as far back as they could remember, it has always been the custom to charge less for the small glass than for the large.

Q. In your opinion, is it possible for the manufacturers to change that custom? A. I think it would be a very dangerous and unfair thing to do.

Q. Please state why? A. For the reason that small glass has not the value that the large glass would have. It would not have the use. The same, as you might say, when a rough diamond is prepared; the cutters naturally desire to get as big a diamond and as flawless a diamond as they can out of that chunk. They will first cut their five or six-carat stone as flawless as possible, and they have to split that in half, possibly, in order to get away from the flaw, and they will have a smaller size, one carat or two carats, and finally they get down to the little, small stones, the fraction of a carat. It is a well known fact that these diamonds of different qualities and different sizes are sold at different prices. That is about as clear an example as I could give as to the differences in the plate glass prices.

Q. Is the continuous process in this country so far confined to small sheets? A. It has been developed along the line of catering to the automobile industry. They use, I should say, about 99 per cent of it in sizes of 1⅔ or 1¾ feet area for windshields and in body glass use 20 by 22 inches, which is a very popular size, with an area of approximately 3 square feet.

THE CHAIRMAN: Q. Increased demand for small glass would tend toward maintaining or increasing the price if the supply did not exceed the demand, would it not? A. That has happened in the past. In these years of 1919 and 1923 that I quoted, the latter part of 1922, also, the price did go skyward, and big premiums were paid because glass was not available.

COMMISSIONER GLASSIE: Q. Did that affect the price of all sizes? A. Yes, sir.

Answering THE CHAIRMAN: For the upper and lower windshields of a Ford car there is required approximately five square feet of glass, between five and six square feet. In a closed car it will run from 17 to 24 square feet, approximately, of course.

So that it is the tendency in the automobile business eventually to get into the closed bodies, and the glass requirements of that industry would naturally be about four times what it was formerly, taking into consideration the fact that the popularity of the automobile has increased the production, amounting last year to something like 4,000,000 cars. The sizes most frequently imported are small glass, I judge about 65 per cent of less than 7 square feet area.

Prices

MR. GALLERT: Q. You said that during 1923 even though there was a famine in the glass market the prices of the imported glass approximately followed those of the domestic. Did you have in mind the list price of the American manufacturers? A. Yes sir.

Q. Were not premiums paid for immediate delivery? A. Oh, yes, very high premiums.

Q. What must be added to the Belgium price to make the price at Detroit? A. Duty, insurance, freight, handling, and overhead expense.

Q. Can you state what it would be? A. For the smaller sizes first the duty is 12½ cents per square foot and the freight to Detroit from Antwerp is approximately 4 cents per square foot, handling expense is approximately 1 cent per square foot, and then we have to add our overhead expense.

Q. Would the maintenance of the present differential or a decrease in the same, in your opinion, have any detrimental effect on the American manufactures? A. At the present time, considering the present current prices, there are certain sizes we are unable to import at all, for the reason that you take the duty and the freight, insurance, and necessary expenses, and it amounts to as much as the glass is being sold for in this country.

I will give you a concrete example. Take the size 12 by 18, for example, the stock size in 1 to 2-foot 8 bracket: the price in this country is 18 cents a square foot. The duty is 12½ cents a square foot. The freight and other expenses would easily add another four cents to that, and that would be 16½ cents f. o. b. Antwerp. Then, taking the freight from Antwerp to the factory, we will say, is another cent, and the packing charge another cent, and you have 18½ cents: in other words, a half cent less than the glass is being sold for in this country.

MR. GALLERT: Q. Will you tell the Commission all of the cases under those brackets which on the basis of the Commission's statement of costs on the other side, allow the foreign manufacturer less than 35 cents for glass? A. Practically everything up to the 10 to 15 square feet in stock sheets, and in cut sizes up to 5 to 7 square feet. I am talking about glazing quality glass, now.

The domestic manufacturer also in some of the small glass allows in some instances 10 cents a square foot; in other instances a little less, for O. B. quality, which is an inferior grade, and that I am not taking into consideration at all.

Q. Have you anything else which would be of aid, in your opinion, to the Commission in this inquiry? A. I think that the duty on very small glass selling at such prices as 18 to 20 cents a foot ought to be eliminated entirely. I do not think there is any justification for it.

Furthermore, I think that the glass above that and up to the brackets that I have enumerated, more particularly the automobile sizes for which there is such demand, ought to be reduced by perhaps one-third.

COMMISSIONER COSTIGAN: Q. What is the reason for your suggestion that there should be no rate of duty on the smaller sizes of glass? A. Because we will take, for example, sizes 10-12, 12-14, 12-18, 14-18—these are all sizes used in small mirrors, 12 by 18 in medicine cabinets, and things of that kind, which are all important and necessary. We are unable to import that glass for the simple reason that we cannot expect the foreign manufacturer to pay us for taking his glass; and if the duty, freight and other expenses I have pointed out practically amount to as much as the glass is being sold for here, naturally we will either have to pay the manufacturer something for his glass, which would make our cost so high that we could not sell it here and could not dispose of it, and of course from a mirror manufacturer's standpoint, it puts him in the position of being up against the proposition

of either paying more money to the foreign manufacturer for the same glass or going to the domestic manufacturer and asking him for a lot of small glass only, which of course he naturally would not do unless he buys other glass with it.

One Rate of Duty

MR. RAFTER: Q. You were asked by Mr. Gallert what would the effect of one rate of duty on all sizes of plate glass be. A. I think it would be a ridiculous situation because if you are to use the basis of the highest current duty for all the glass it would make the small glass a burden. The costs would have to increase or we could not get it into this country at a competitive price or anywhere near the price at which the domestic manufacturers are selling their glass, the 65 per cent of the glass which we are now using, because that would make the foreign price considerably higher, and naturally we would have no standing.

Q. What are the extremes in the prices of all sizes and quality of plate glass according to the American list? A. It runs, in glazing quality stock sizes or stock sheets, from 18 cents in the smaller glass to $1.40 for the largest bracket per square foot. And in cut sizes it is from 20 cents to $1.65 per square foot.

Q. If that is true is is also true of the foreign list, that there will be that same variation between the smallest size and the largest size? A. Not the price f. o. b. Antwerp, but by the time we add the duty and the other expenses it would be approximately the same.

Q. If that is true on both the American and the foreign price list and if one rate of duty, a specific rate, is placed on all sizes, obviously the ad valorem equivalent of that specific rate will have a very wide variation, will it not? A. Absolutely.

Q. Obviously also the ad valorem equivalent would be smaller from the highest price glass and highest on the lowest price glass? A. Yes, sir.

Q. And you say that even today that operating under a lower rate of duty from the smaller sizes rather than an average rate for all you are unable to sell the very small sizes? A. Since the prices of July 25th we have not imported any of these small sizes.

Belgian Connections

MR. MCKENNA: Q. Would you say under oath that you know the Belgian manufacturers are not financially interested in this plate glass consumers association? A. I don't know. I have no knowledge about it.

Q. Have they participated in your conferences? A. Yes; we have asked them to.

Q. Well, tell me how actively the Belgian manufacturers, the same fellows who declined to give the Commission information as to costs, are interested in this association of plate glass consumers?

MR. RAFTER interposed an objection.

MR. MCKENNA: My object in making these interrogations is simply this. Your tentative report shows that cost data was denied your representative when he went into the Belgian country, with one exception. Now, the impression is left on me for the mention of that name is that they are coming here and trying not only to prevent the getting of information abroad but putting information in in such a way here that it will cloud the issue, and for that reason I thought it might be well to develop it.

MR. RAFTER: I may be able to reassure counsel for the opposing side on that point by anticipating something I had intended to bring out at a later time and at a more logical time. I am quite willing to state now that the two manufacturers from Belgium for whom I appear through me will give the Commission permission to investigate their cost records, records of cost and production, if the Commission is so disposed. The reason for the refusal in the past I will not dwell upon now.

Quality of Ford Glass

MR. MCKENNA: Q. Do you know anything about the quality of the Henry Ford glass as compared with the other manufacturers throughout the United States? A. The quality has been improved to such an extent that while they gave me an order for some silvering glass for their Lincoln cars, which is in the same category as the Pierce Arrow and Packard, they cancelled it because they were able to get it from their own plant.

Q. Then, from your testimony I would assume, or would I be justified in assuming, that the glass manufactured by Mr. Ford is of the highest kind? A. No. I say they do make, as a matter of fact, no plate glass in this country or anywhere in the world such as the silvering quality of glass—

THE CHAIRMAN: Q. Doesn't that mean they put into the Lincoln car the same quality as the Ford? A. No, sir. They have a very high inspection standard for the Lincoln car. In the Ford car they buy glazing quality, the same as the Fisher Body Company and other automobile people. It is only the high grade cars such as the Pierce Arrow and Packard which use silvering quality.

Q. When it makes this glass does it make glass of the same quality? A. They aim to produce glass which is good enough for their use, but they don't take the best quality and sell it. In the Lincoln car, their inspection standard being much higher, they have to select that glass the same as any plate glass factory, whether in this country or abroad, would have to do.

MR. MCKENNA: Q. Is it or is it not a fact that all glass used in the Ford cars is made at the River Rouge or the Highland Park plant, or do you know? A. They use a great deal of glass from Allegheny.

Q. Do you know whether they use any glass in the Lincoln car that is made at either the Highland Park or River Rouge plant? A. The purchasing agent told me—As I said, they cancelled an order.

Q. Doesn't Ford get his Lincoln glass only from Glassmere? A. That is not the information I got.

Q. Is your information then to the effect that he does use in his Lincoln cars this plate glass from the River Rouge and Highland Park plants? A. I think they get a small percentage from there and a small percentage from other places.

Q. Is that a definite statement from an official of the Ford Company? A. Yes, sir.

Q. Is the quality of glass used in the Ford car the same as in the Lincoln car? A. No, sir.

Q. Does it seem reasonable then that he would draw his chief supply for the Lincolns from Glassmere and not from Highland Park and River Rouge? A. In the making of plate glass where the plate glass comes from some of your plants, whether it is for Ford or anybody else, the glass has to be selected and the defects cut away. The amount of silvering glass obtainable, even in the best factory, is a very small percentage.

Belgian Discounts and Allowances

Q. Isn't it a fact that in your purchase of Belgian glass you get 1 per cent and 2½ per cent for cash, and that in addition to that you get—

And this, if the Commission please, is very important as affecting the competition between the foreign and the American glass.

Isn't it a fact that Belgian exporters make concessions to the trade of cash discounts of 1 per cent and 2½ per cent, and in addition to those discounts of 1 per cent and 2½ per cent, they make breakage allowances of 2 per cent up to 25 feet, 3 per cent from 25 to 100, and 5 per cent over a hundred feet, regardless of whether or not any breakage occurs in transit? A. That has already been answered by virtue of the price list which has been put in evidence.

Q. Do you on shipments made to Detroit or St. Louis or Memphis or Omaha or Denver equalize freight? A. No, sir.

Q. Do the Belgian manufacturers make any allowances of that character to you on shipments destined to any of those points, or is that confidential? A. I will be glad to answer that question in view of your remarks because it does not affect the prices very much at all. As a matter of fact, on windshield glass we do not get any freight allowance whatever. Our cost of windshield glass is higher than domestic.

On mirror glass or other qualities we get nothing whatever. On stock sheets up to 15 feet we get nothing at all. On some cut sizes we get an allowance which amounts to a cent and a half a foot, or sometimes 2 cents. It has never exceeded, to my knowledge, 3 cents. That has not always been in vogue.

Q. How long has it been in effect and how long has it continued? A. About a year, and that is taken into consideration when we quote prices.

Q. Have you ever heard of the American manufacturers demanding a premium for their glass during 1919 and 1923? A. I can't tell you the exact figures, but I have heard the Standard Plate Glass Company and Heidenkamp Plate Glass Company and a couple of others got some very nice prices for their glass regardless of the established price lists.

Rates of Duty

Q. You say that the same rate of duty should not apply on all glasses alike? A. Yes.

Q. And you make that statement without being possessed of the cost figures? Am I correct as to that? A. I based that on the selling price, selling values.

Q. You do not profess to know anything about the cost of production, foreign or domestic? A. Except as to the new process.

Q. At all events, you haven't any cost figures to substantiate your conclusion that the same rate of duty should not be applied to all kinds of glass. A. Other than what I have already explained.

Q. Why do the manufacturers sell these small sizes, say under 2 feet 8 at such a low price? A. God only knows. I have been trying to find out myself.

Q. During the past several years have you found any pronounced difficulty in getting the small sizes under 2 feet 8 at a given time, except for a period of a few days? A. Well, it depends upon the sizes they are. For example, 12 by 18 has been quite a popular size with us, and we have had to wait quite a time for it.

Production and Consumption

MR. MCCUMBER: Q. What I want to get at is this, whether the capacity for production in the United States exceeds the consumption in the United States at the present time. A. No; I think that there would still be an excess of requirement. As a matter of fact, it is well to call attention at this time to the fact that when the mirror manufacturers were requiring mirror glazing and silvering glass they could never obtain the quality in sufficient quantities from domestic manufacturers, and they are obliged to buy from the other side.

Q. It would be such, at least, that there would not be the danger of the conditions which existed in 1919 and 1923? A. As a matter of fact, we have a somewhat similar condition on a lesser scale in New York at this time. When I left New York we had quite a quantity of orders on our books that we could not fill, and from people I had not heard from in two or three years, calling up and asking us to give them glass.

Q. A similar condition on a smaller scale is not a recurrence of that. A. What I mean to say by that is that the high prices of 1923 are not in vogue, but they are getting more money today than they did a year ago, and there is less glass on the market.

Witness' Suggestion Discussed

Q. You made one statement here which, if based upon accurate and definite information, ought to settle this whole question so far as the Commission is concerned, and that statement was that the duties ought to be reduced on these smaller sizes at least one-third, if I understood you correctly. A. On the automobile sizes and mirror sizes and wiped out entirely on glass selling at 18 cents a square foot.

Q. That is based, if I understand you correctly, not on any definite information as to the cost of production, but entirely upon the manufacturers' selling price? A. No; it is based upon two things—the selling price of domestic manufacturers here, and on common sense to this extent, that when glass is selling at 18 cents and the duty, freight and other charges amount ot 18½ cents, we are out of luck. We cannot supply small sizes to our trade.

Q. We appreciate that, but nevertheless have you any information which would lead you to definitely state that with the cost of production in the foreign countries that the duty should be reduced one-third to nothing in order to equalize the difference in the cost of production at home and abroad? A. I do not say that glass does not cost anything at all, for you would finally get to a point below zero.

Q. Do you know what it costs to produce those lower grades of glass? If you don't know what it costs to produce it there and if you don't know what it costs to produce the same thing in the United States, you are not in a very good position to state whether it ought to be lower or that it ought to be taken off entirely, if you want to get the difference between the cost of production as between the two countries. A. I don't agree with you, Mr. McCumber. I will repeat again we have to have small sizes, and if we can't get it in this country we have to buy it there. And if your duty and other expenses amount to as much as the glass is being sold for, I can't offer the manufacturers on the other side nothing for their glass. I have to pay them something, no matter how little it is. And if we pay them one cent it is more than the glass costs in this country.

Q. Now, you say the domestic manufacturer fixes the price? A. Yes, sir.

Q. For the foreign? A. Yes.

Q. That simply means, if I understand it correctly—and I think I do—that the foreign manufacturer will sell at the price that he can sell just in competition, or the same price that the domestic manufacturer gets for the same item? And they may net in profits two or three or four times as much as the domestic manufacturer, may they not? A. That is for the Commission to decide. I don't know anything about that.

Q. But you do know the manufacturers on the other side will get all they can on this side for their profits, and that therefore he will sell it not to compete to any great extent with the American manufacturer but to get the highest price he can for what he can sell? A. That is rather a hard way of putting it. I don't like to put it in that way. I don't think it is quite fair.

Q. You can put it with the soft pedal on if you wish. A. I think it is only fair, in justice to them, to say this, that they have not been underselling the domestic manufacturer to get business here; that when the domestic prices are announced, all they do is to follow the prices.

Q. Do you know whether or not the Belgian manufacturer is really fixing a higher price for his product at Antwerp for sale in the United States than in England or in Belgium itself? A. I am sorry I cannot answer that question, because I do not know. But this might enlighten you. Pilkington Brothers, who make plate glass in England, are also supplying from that country the Ford Motor Company and other customers in the United States. Whether that has any bearing on the selling price in England, I cannot say.

Demi-Plate

Q. And not all of this glass that your testimony covers is plate glass? A. It is all window plate glass.

Q. And therefore that which is ground and then polished is window plate glass? A. That is it.

Q. And the only real distinctive feature in the matter? A. To my knowledge, I think so, yes.

Q. What is this demi-plate? A. The same as Libbey-Owens, simply with the different name. The Libbey-Owens is drawn in the form of a ribbon flat horizontally and the demi is drawn Fourcault, drawn up into the air.

Q. That is not plate glass? A. No, sir; it is sheet glass, the same as Libbey-Owens, or the same as made by the American Window Glass Company.

Q. You are talking about something then as plate glass that is not plate glass? A. How is that?

Q. That is sold as plate glass, isn't it; it is advertised as demi-plate? A. I don't know.

Q. Do you advertise this so-called Czecho-Slovakian glass as plate glass? A. No.

Q. You call it demi-plate? A. Yes, demi-plate, which is another name for crystal sheet glass, the Libbey-Owens crystal sheet glass.

Q. Is it competitive with plate glass? A. To same extent that Libbey-Owens crystal sheet is, or the American Window Glass sheet.

Q. It is used as a substitute for plate glass in the building trades, is it? A. To a small extent, yes.

Q. It is used in the furniture industry? A. I don't think so.

Q. In the showcase industry? A. To a small extent, I believe, yes.

Q. Where else is it used as a substitute for plate glass? A. It may be used for shelves, and some of the replacement shops who put in glass for broken automobile windows who will use it the same as they use Libbey-Owens crystal sheet or the American Window Glass crystal sheet. They are all window glasses.

Q. The demi supplants the regular plate glass? A. I wouldn't say that it supplants it, because the Ford Motor Company wouldn't use it. They did use Libbey-Owens at a time of a scarcity when they couldn't help themselves.

Q. Don't they use it for mirrors? A. No; I never saw a mirror of demi-plate.

MR. MCKENNA: Q. Mr. Solomon, at the conclusion of the hearing on yesterday I was discussing with you the so-called demi-plate glass, which, as I understand it, comes from Czecho-Slovakia; you buy some of that glass, don't you? A. Yes, sir, in considerable quantities.

Q. I notice in your price list of November 10th you advertise it for automobile replacement parts and that you offer it as low as 25 cents per square foot, no charge for boxing, f. o. b. New York, less 5 per cent discount for orders of five cases or more? A. Yes, sir.

Q. How is that glass billed you? Is it billed as drawn sheet glass? A. Yes, sir.

Name Came from Abroad

Q. How do you get the name "demi-plate"? A. That is a term put on it by the foreign manufacturer. It is a descriptive term, the same as Libbey-Owens would call the glass that they produce Libbey-Owens crystal sheet glass, and the American Window Glass Company call theirs the American Window Glass 39 ounce glass.

Q. In ordering you order it factory run quality drawn sheet glass, or something of that sort? A. They have two or three qualities.

Q. It is all drawn glass? A. All window glass.

Q. They do not advertise it as demi-plate? A. No.

Q. You do not order it as demi-plate? A. They call it demi-plate.

Q. Is that the way you order it from the plant at Teplitz? A. I don't order direct from the factory. They have a selling agent in New York.

Q. And you do not advertise it as drawn sheet glass but you do advertise it as demi-plate? A. It is known in the trade as that, and that is what it is.

Q. And your price list shows that it is actually used in and for replacement of plate glass in the automobile industry? A. The replacement there does not mean the replacement of plate glass. It means the replacement of broken windows in automobiles.

Q. It certainly does not replace the common or ordinary variety of window glass? A. It is exactly the same as the American Window Glass Company's 39-ounce and exactly the same as the Libbey-Owens crystal sheet glass. As a matter of fact, I can say this, that we have sold some of that glass to one of the branches of the Standard Plate Glass Company, who, I presume, have bought it for the same purpose; and the Pittsburgh Plate Glass Company have also placed orders for the same glass with the same people.

Q. In the replacement of this demi-plate in say an automobile wind shield or automobile door or body, it takes the place of plate glass, doesn't it? A. I don't know. I can't answer that,—

Q. Just a minute. What is your standard equipment of automobile bodies, window glass or plate glass? A. Both.

Q. In what part do they use window glass? A. For instance, Nash uses a considerable quantity, and according to the information given to me by the purchasing agent of Dodge Brothers, they use a certain amount of it, and the purchasing agent of one other large body building concern who do work for several automobile companies told me that they use about an equal amount of this glass, crystal sheet glass, with an equal amount of plate glass.

Q. Would you deny the statement that this demi-plate is not extensively used as a substitute for plate glass? Don't you so advertise it? A. No, sir. We do not advertise it as a substitute for plate glass.

THE CHAIRMAN: Mr. McKenna, wouldn't you be good enough to inform the Commission of the purpose of this line of inquiry? I understand that this glass called demi-plate is not the plate glass which the Commission is investigating; it is not classified by custom as plate glass.

MR. MCKENNA: That is precisely the point I wanted to develop, Mr. Chairman.

Duty Makes Importation Impossible

MR. MCKENNA: Q. I inquired of you yesterday, Mr. Solomon, concerning certain small sizes of plate glass.

Q. Do you know whether or not small sizes have always been sold, except in periods of abnormal demands, at far less than the cost of manufacture? Have you tried to buy any of these sizes, except in the case you illustrated from Ford, from American manufacturers in the past several years? A. We bought from the Pittsburgh Plate Glass Company some of this glass about three or four months ago. We could not import this small glass because it would cost us considerably more, by paying the duty and freight and other expenses, than the glass can be bought for in this country.

Q. Have you any figures to substantiate your statement concerning the relative cost of the foreign and American small glass? A. No, sir.

Q. You stated yesterday concerning premiums that are being offered in New York at the present time and have been offered within the past few weeks. To whom were those premiums offered? A. I know they have offered it to us. If we wanted to charge them two or three or four cents a square foot more, we could do it.

Control of Belgian Prices

THE VICE-CHAIRMAN: Q. Are Belgian prices competitive prices or controlled prices, in your estimation? Is the Union Commerciale des Glaceries Belges a cartel? A. No; because in Belgium there are other factories that are not in the Union Commerciale des Glaceries Belges.

Q. How many are outside of it? A. There is one at Franier, which I think is owned by the St. Gobian company, which has its office in Paris. There is another factory, that of Pilkington Brothers, in Maubeuge, in French territory about 7 or 8 miles from the Belgian border.

Q. Isn't the organization tight enough to control prices, if necessary; that is, can't the centralized selling agents for these six factories, if necessary, control prices and sell cheaper in the foreign markets than in the domestic markets on the principle of the Cartel? A. I doubt it very much. There are factories in Germany, in Czecho-Slovakia, and in France, and there are the English factories who all sell in the same markets. Pilkington ships glass to New York and Detroit, etc. The German factories ship glass to New York, Detroit, etc., and the Czecho-Slovakian factories, and the French factories, and I think also a factory in Holland.

Q. They have the power whether they exercise it or not?

Q. Are the Belgian prices ordinary competitive prices or are they controlled prices? A. Among these six factories it is true, they are controlled.

MR. PRESMONT: May I invite the Chairman's attention to page 5 of the report of your own investigating committee, which I think covers it very completely, and I believe answers the question.

THE CHAIRMAN: Q. If the information contained in the Commission's statement, to the effect that Belgian costs of production are lower than other European countries and that the amount of plate glass produced is greater than that of other European countries, Belgium would be in a position naturally to control the price of plate glass in Europe, being the largest producer and the lowest cost producer. That would tend to give them at least some control over the price at which plate glass is sold in Europe? A. No, sir. I don't think that is entirely correct, because it would only be fair to add the production not only of Germany but the production of France and Holland and Czecho-Slovakia.

Q. And also control the price at which that glass is produced? If Belgium is the largest producer and the lowest cost producer, she unquestionably has dominance in that market.

MR. MCKENNA: During your visits to Europe did you ever hear of that International Convention of plate glass manufacturers? A. Yes, I read it. For many years I have heard about it.

Q. Do you know whether or not this Convention controls any of these factories, not only in Belgium, but in Germany, in France and Holland? You don't know whether that Union Commerciale is a subsidiary of that International Convention or not? A. I don't know anything about it, no, sir.

Q. What percentage of the glass sold by you is moved from your warehouses? A. The largest per cent.

Q. 90 per cent? A. No, sir. Q. 40 per cent? A. I don't know the exact percentage, but I should judge the largest per cent.

Continuous Method Abroad

MR. MCCUMBER: Q. What foreign companies are now using the continuous method of manufacture of plate glass? A. None that I know of.

Q. Are they using a method which is similar? A. Not that I know of, no, sir.

Q. There is no patent upon this new process that you speak of, is there? A. I have noticed in the GLASS INDUSTRY many patents are being issued to various companies. But whether it is that process or not I don't know.

Q. So far as you know, Mr. Solomon, there is no reason why the Belgian companies cannot produce their glass in the same way under this new method if they reconstruct their plants, the same as they can do it in the United States? A. If these patents issued to the Pittsburgh Plate Glass Company and the Ford Motor Company, and perhaps some others, cover this process of making, I suppose they would not be permitted to unless they paid royalties or something.

Q. But suppose it is not covered by patents. You don't know that it is? A. I cannot answer that.

Storage Facilities

MR. PRESMONT: Q. Now, I call your attention, Mr. Solomon, to page 102 of the stenographic report of the transcript of testimony taken in this hearing, the examination by MR. GALLERT, reading:

"Q. Do you know the reason why automobile manufacturers will buy domestic glass when they can get it rather than foreign glass? A. In the first place, the foreign manufacturer, on account of the distance from the Detroit district, cannot possibly land glass at Detroit before six or eight weeks, and it sometimes requires three or four months, whereas American factories, being located much nearer to some of them, just within a few hours of them, naturally can make their deliveries very promptly."

MR. PRESMONT: If I may be permitted at this time, I would like to introduce an article and read certain excerpts. I have just offered it in evidence and just previously had it marked for identification.

MR. PRESMONT: (Reading) "In the first place, L. Solomon & Son carry tremendous stocks. They have available in their stocks warehouse and other small store-rooms in their office building a total of 250,000 square feet of floor space. This enables them to store immense quantities of all varieties of flat glass on the market. It would be hard to determine which was their specialty. Perhaps their sale of Belgium and French plate glass and Czecho-Slovakian and demi-plate would be termed most important, but they sell great quantities of window glass, colored and opal glass, jewels for parking lamps, glass rosettes, glass-headed screws for the popular Venetian mirrors and other varieties.

"Because of these tremendous stocks—more than half a million square feet of glass, excepting window glass— and with weekly arrivals from abroad, it is possible to give the fastest kind of service.

"The determination to give promptest service humanly possible, and make such prompt service consistent at all times, has resulted in this plan of carrying huge stocks, so that when an order is received for any kind of stock it is immediately filled.

"This is true in every department, and as an interesting example of this service may be mentioned the plate glass department.

"Frequently he goes to Europe, at which times he combines business with pleasure, visiting the factories from which he obtains his glass and checking up on conditions there."

COMMISSIONER COSTIGAN: Will you give the pages and the issue? MR. PRESMONT: This publication is the *Glass Worker*, issue of October 31, 1925, at page 31.

Q. And, Mr. Solomon, there are about 30 carloads of glass in that consignment, are there not? A. About 12 or 14, I Imagine. In the first place, what I wish to say is that the statements have been exaggerated by an enthusiastic reporter. The quantities of footage of warehouse space indicated there is about 250,000 and inasmuch as I told him only about 150,000, I don't know whether it was a typographical error or not. He has it here as 250,000, from what counsel just read. In the second place, this is warehouse space which we have available at these various cities and for which they charge us according to the amount that we store. Explaining the 500,000 feet, this is 500,000 feet including colored glass, demi-plate glass, brown glass and a lot of other sheet glass, which would reduce the plate glass to about 100,000 to 125,000 square feet, or perhaps 150,000 square feet. This plate glass is in the form of stock sheets almost entirely—99 per cent or more in stock sheets of glazing quality, mirror glazing quality and silvering quality in various thicknesses. And that is kept there and it has been a great convenience to the trade in general, when they cannot get their supplies from domestic factories, to buy from these stock lists. Our selling prices on these stocks are higher than the domestic prices.

Q. Of course you immediately protested to the author of this article about the misrepresentations contained in it? Did you do that? A. I did when I saw him.

Q. Did you ask the publication to make public a statement to the effect that the matter contained in that statement was erroneous and might be misleading? A. No, sir. It was only flattering.

Freight Rates to West Coast

MR. PRESMONT: Q. Have you any figures that would show a different situation from the figures now before the Commission on the question of the differences between the cost of production here and the cost of production abroad? A. No, sir.

Q. Is it not a fact that the freight rate from Antwerp to the Pacific Coast is 1½ cents per square foot? A. About two years ago or a year ago, the freight for small sizes was about 2 cents.

Q. Is it not a fact that the rate from any domestic plant to the Pacific Coast is 6 to 7 cents a square foot additional? A. I do not know what the exact rate is.

After a long drawn out discussion as to the savings effected by the new continuous process, the percentage of small sizes imported, trade customs, and so forth, during which the witness, MR. SOLOMON, stated repeatedly that he had no knowledge of plate glass production costs, he was excused and JOSEPH VAURIE, United States selling agent for the St. Gobain Company of Paris, France, took the stand.

MR. VAURIE explained that in preparing himself for his work in this country he spent practically a year in his company's plants, going through the different departments and familiarizing himself with all the operations. In the summer of 1923 he visited the Highland Park plant of the Ford Motor Company. At the request of MR. GALLERT he then gave a graphic description of the differences between the old casting and grinding process as used in his company's plants, comparing it with the new continuous process recently developed here and pointing out the savings effected by the latter, especially in labor.

Mr. Vaurie Testifies

MR. VAURIE was then questioned by THE CHAIRMAN:

Q. Do I understand you to say that you were told that the cost of production of glass by the new process that you were defining was 35 cents per square foot? A. Either 35 or 33, I don't remember exactly. That is what was told in front of me to a third party by a gentleman, Mr. Avery, of Ford Motor Company, who is quite an authority in the matter.

Q. Do you know whether that was the factory cost of production alone without the inclusion of interest? A. That I cannot tell you, your Honor. I believe it was the manufacturing cost.

Q. That would compare then with the cost in the United States for the first quarter of 1923 given in the Commission's table of 45 cents per square foot? A. Well, I cannot tell you.

Q. If it was the factory cost, that is, the manufacturing cost of the new process, we have the direct evidence that has been presented of the actual cost of production under the new process, and I understood you to say that you were told that it was 35 cents? A. Yes, sir.

Q. I was interested merely in comparing it with the cost figures given in the Commission's statement of information. If it was the manufacturing cost alone it would compare with what is stated here as American cost of 45 cents for the first quarter of 1923. It that what your figure is? A. I can't tell you that. All I can say is what I heard.

Q. Of course, we could not tell what weight to give to your 35 cents without knowing whether it included interest or all other costs. A. I earnestly believe it was the manufacturing cost.

MR. GALLERT: If the Chairman pleases, that is corroborated by the statement of Mr. Avery.

MR. MCCUMBER: Q. What plants in France or Belgium are either using or contemplating the use of the new system, if you know? A. I don't know of any plants in France or Belgium that are contemplating it.

Q. Do you know of any reason why the same system, if it is a better system, cannot be adopted in the old country as well as in this country? You know of no reason to prevent their constructing their plants the same as we construct them? A. I never guess about anything, and I think I would better not say what I don't know.

Quality of New Process Glass

COMMISSIONER GLASSIE: Q. Do I understand you to say that you don't know whether this glass produced by the continuous process is of the same quality and kind as cast and ground and polished plate glass? A. Well, I never examined any of that glass to any extent.

Q. If it is not the same glass, how do you say that an economy in its production is accomplished by this method? How do you possibly compare the cost of production of 35 cents with the cost of production of 45 cents unless you are comparing the cost of the same thing? A. I did not examine enough glass of that manufacture to have any opinion on it with regard to the quality of that glass. The fact that this glass is not used in high priced cars would lead me to believe that they have to get better glass for high priced cars.

Q. Then your comparison must be a comparison of the cost of production of substantially the same thing, must it not? And if it is not the same thing, what is the use of saying one costs 35 cents as against the other at 45 cents? A. It always costs the same to make good glass or bad glass. When a man casts glass he does not know what he is going to get, whether he is going to get silvering or whether he is going to get glazing.

Ford Motor Company Costs

Q. There is in evidence here a copy of the *Journal of the Society of Automotive Engineers.* On page 456 of the April, 1925, edition an article by Mr. J. H. Fox appears. Mr. Fox states there that at the present prices of plate glass, no plate glass company is making an extreme profit.

At the time you visited the Ford plant the cost of the plate glass was 60 cents—by the way, that is C. W. Avery, the very man you talked to. This article is written in April, 1925. He says in this article, that at present prices of plate glass no plate glass company is making an extreme profit. At that time, to the time of your visit in 1923, the price of automobile plate glass was 60 cents. Under your testimony the cost was from 33 to 35 cents, making 25 cents a square foot. Do you think that the statement of Mr. Avery in this article is harmonious with the statement that you thought you heard when he said—I want to know what that 60 cents was? A. The 60 cents is the 60 cents per square foot for automobile glass, selling price.

Q. That is all right. So you have a range between 60 cents selling price and 35 cents cost, or 33, we will make it, plus 27 cents per square foot. That is an abnormal profit for glass, is it not? Are you positive that you heard him say manufacturing cost? Are you positive, Mr. Vaurie, that when you went to Ford and looked over both the Highland Park and the River Rouge plants your engineer was not making an investigation into the respective merits of these two processes? A. I do not know that. If the engineer were here he might tell you.

The International Convention

Q. Where did you get these figures about the prospective production abroad? A. This is hearsay that I gathered around the offices in Paris.

Q. Did you get those statements from the International Convention? A. No.

Q. Are you members of the International Convention? A. Yes.

Q. Is it not a fact that all the plate glass manufacturers in Europe, with the exception of Pilkington and the plant at Courcelles are members of that organization? A. Yes.

Q. Is it not a fact that the organization controls the output of the plate glass manufacturing of Europe? A. That organization is there for the purpose of regulating the production and regulating the price.

Q. Does not the organization also have the power to shut down any particular plant at its will, under the Convention? A. I do not know that.

Q. Is the Commercial Union a subsidiary or an adjunct of the International Convention? A. Do you mean a member? Yes.

Q. Members of the Convention are entitled to go out and make their sales without consulting the Convention, so long as they preserve the Convention price? A. Yes.

Q. The Convention prices for particularly American consumption are fixed and definite and cannot be changed by any member of that association, can they? A. Not without general consent of the others; no.

Q. Or general consent of the Convention itself? A. Yes. There has to be a change in Convention.

Q. Is there a German sales organization connected with and subject to the Convention? A. Yes.

Selling Prices

MR. RAFTER: Q. Counsel for the opposition has stated that—in 1923 automobile glass cost 60 cents per square foot. A. The selling price.

Q. Do you know whether or not the Ford Motor Company was selling at that time any glass produced at a manufacturing cost of 35 cents or 33 cents, at a price of 60 cents? A. I do not know.

Q. Do you know whether or not that 60-cent price related to plate glass produced by the old method? A. I believe it was mostly related to the old method.

MR. GALLERT: Q. When you referred to the new process plate glass as not being used in high priced cars, did you have in mind the majority of cars or the minority of cars used in this country, or what did you mean? A. The high priced cars, I would say, cars like the Packard or Pierce Arrow, cars that cost about $4,000— the Lincoln, for instance.

Q. But in all other cars the glass made by the new process and the glass made by the old process was used indiscriminately? A. Yes, sir.

Opposes Postponment to Obtain Foreign Data

MR. MCKENNA: You have here a situation suggested by MR. RAFTER of two Belgian companies offering you, at this time, access to their books. Those companies are members of the International Convention which was disclosed by the testimony of Mr. Vaurie. Inasmuch as the books of their companies alone might be misleading, it might be that during a certain period of the year these particular companies may have been shut down, and their costs may have been extremely high, whereas the profits of the International Convention in which they participate may have been abnormal. So that your investigation might disclose nothing. It might or it might not. I think the Commission would feel justified in making a conclusion upon what is before them. Certainly under the offer of Mr. Rafter you could not hope for the exact Belgian costs for the reasons that I have explained, and I would most urgently dwell upon the point that they be given no additional time within which to furnish those data.

A long discussion on the subject followed, after which the chairman announced that an adjournment would be taken over the Thanksgiving holidays until 10 a. m., Monday, November 30.

On Monday and Tuesday F. D. Campau, representing the Furniture Association of Grand Rapids, gave evidence, which concluded the case for those interested in a reduction of duties. As THE GLASS INDUSTRY was going to press evidence in opposition was being given by H. J. Eckenroede, of National Plate Glass Company; F. E. Troutman, president, Standard Plate Glass Company, and J. W. Cruikshank, consulting plate glass engineer.

The hearing closed on Tuesday, December 1. The decision of the commission on the question of making a new investigation covering developments of new processes since 1923, will be announced on December 15.

Glass Industry

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A Great Glassmaker

In the death of Edward Drummond Libbey which occurred on November 13th the American glass industry has lost one of its great leaders. The story of his life is one of the romances of American industry. Like many others of his generation he was willing to leave behind his home in the East, the business built up by his father and by his own efforts, and to heed the call of the West. The sturdy qualities which enabled the early pioneers to develop the great resources of the western country, courage, persistence, foresight, Yankee business acumen, were possessed by him in a large measure. The vision which led him to break with the past caused him to discern the germ of success in enterprises that were considered hopeless by his contemporaries. Every success became the stepping stone to greater achievements. Finally, with magnificent generosity, he donated to the city of Toledo, grown into prominence largely through his efforts, a great part of his personal fortune.

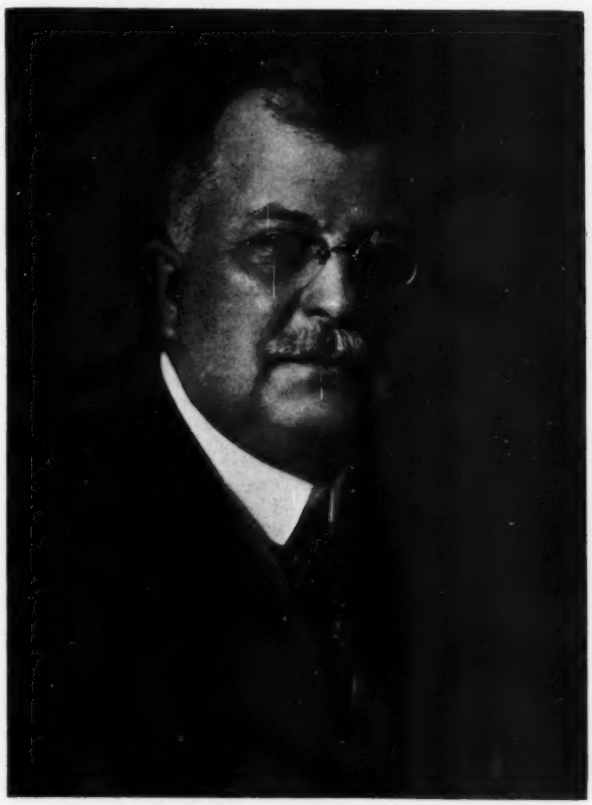
Born in 1854 at Chelsea, Massachusetts, the son of a glass maker, he entered his father's business at the age of twenty and began at the lowest rung of the ladder, in order to learn every detail of the glass business. On the death of his father in 1883 he became the head and sole proprietor of the business which he continued to develop.

When natural gas was discovered in northwestern Ohio, Mr. Libbey was quick to realize its immense advantages as a fuel and transferred his enterprise to Toledo, where it was incorporated under the laws of Ohio as the Libbey Glass Company. The firm went into the manufacture of cut glassware and Libbey cut glass became known the world over. Realizing the value of publicity the Libbey concern erected its own building at the Columbia Exposition in Chicago in 1893 and installed machinery to produce cut glass articles. A similar exhibit was staged at the Louisiana Purchase Exposition in St. Louis in 1904.

The financial success of the Libbey Glass Works enabled its founder to engage in the development of automatic glass making machinery. It is largely due to Mr. Libbey that two great inventions have been successfully developed, the Owens bottle machine and the Colburn machine.

Michael J. Owens entered the employ of the Libbey Glass Works in August, 1888, and become its superintendent in November of that year. From that date began the co-operation of the two men which has completely revolutionized the glass industry. The amount of effort and capital needed to develop the Owens invention from its crude beginning to its amazing perfection would have discouraged those of less courage and vision. In 1903 the Owens Bottle Machine Company was founded, later reorganized as the Owens Bottle Company with its subsidiary the Owens European Bottle Machine Company. These concerns introduced mechanical bottle manufacture all over the world. Few, if any, American inventions have been so successfully promoted and so universally introduced. The companies are a monument to their founders' genius for organization.

It was largely owing to the efforts and insight of Mr. Libbey that the Colburn machine was developed to a complete success. Colburn's ideas, which took definite shape in



EDWARD DRUMMOND LIBBEY

Born 1854 Died 1925

1905 were worked out by the Colburn Machine Glass Company organized in 1906. After years of struggle and the expenditure of more than a million dollars, the company was forced into bankruptcy and its assets including the Colburn patents were put up at public auction in 1912. The purchase of these patents by the Toledo Glass Company marks one of the momentous events in the history of the American glass industry.

The work of developing the Colburn machine seemed a hopeless undertaking for several years. It was not until another million dollars had been spent in years of untiring labor that success became assured. In 1916 the Libbey-Owens Sheet Glass Company was formed which bought from the Toledo Glass Company all of its patent rights. Like the Owens Bottle Company the manufacture of flat glass by the Libbey-Owens process is spreading over the world.

Mr. Libbey was greatly interested in art and endowed the city of Toledo with an Art Museum which has become one of the most notable in the country. As president of the Toledo Museum of Art he was a constant patron and benefactor of the institution. In his will the bulk of the testator's extensive and valuable collection of art treasures was left to the museum.

The work of Edward Drummond Libbey has left an ineffaceable imprint on American industry. He has had a large share in making glass manufacturing one of the great and progressive industries of the country.

Technical Consultation Service

QUESTION 81.—USE OF SODIUM HYDROXIDE FOR SILVERING MIRRORS.—I understand that in the manufacture of mirrors there is a formula for silvering in which caustic sodium (sodium hydroxide) is used as a precipitant and which works wonderfully as a cold solution. Can you give me any information as to the ingredients and mixing of the formula?

ANSWER.—We give herewith information on the subject obtained from two sources.

No. 1.

Any silvering formula that calls for aqua ammonia 26° as the precipitating factor for the silver nitrate can be replaced with sodium hydroxide and used identically the same. The resulting silver precipitate in either case is oxide of silver from the nitrate of silver which is redissolved in either solution of aqua ammonia or sodium hydroxide when in excess.

The following formula could be used with sodium hydroxide C. P. as follows:

Solution A.

Distilled water	5 fluid ounces
Nitrate of silver (C. P.)	1 ounce

When the silver is all dissolved add a concentrated solution of pure sodium hydroxide until the brownish precipitate that is formed as oxide of silver is just redissolved. Now add an additional amount of distilled water to make up 100 fluid ounces.

Solution B.

Distilled water	20 fluid ounces
Granulated sugar	2 ounces
Rochelle salts	2 ounces

In two ounces of water reserved from solution B, dissolve ½-ounce of nitrate of silver and mix with the other ingredients. Boil the solution slowly for 30 minutes, replacing the water lost by evaporation. The solution should cool down to normal temperature, when the two solutions A and B should be mixed for use under regular silvering methods.—C. H. P.

No. 2.

There are four such methods named after their inventors: the Liebig method, the Martin method, the Foucault method and the Benrath method. Of these procedures the latter is rather simple and will therefore be selected for detailed description. Benrath gives the following outline:

Prepare the following solutions:

A. Dissolve 80 parts of silver nitrate in 500 parts of water (1). Dissolve 120 parts of ammonium nitrate in 500 parts of water (2).
Mix (1) and (2) giving solution "A." (Keep in the dark).

B. Dissolve 130 parts of pure sodium hydrate (free from chlorine) in 1,000 parts of water. Instead of sodium hydrate 182 parts of potassium hydrate may be used (it is easier to obtain this material free from chlorine).

C. 15 parts of sugar and 1½ parts of crystallized tartaric acid are dissolved in 100 parts of water. This solution is boiled for one-half hour, during which time the volume is kept constant by adding water as it evaporates. The solution should not be allowed to turn brown. After boiling, dilute with water to 420 parts.

A, B and C are the stock solutions.

To carry out the silvering, add to 400 parts of water 100 parts of solution A, mix carefully and then add 100 parts of solution B. Mix well and allow to stand at least 12 hours in a dark place (Solution "S.")

The glass is carefully cleaned and the approximate surface to be silvered is computed. For each square centimeter take 1½ cubic centimeters of solution "S" and add from 7 to 10 per cent of solution "C." Mix rapidly and pour upon the glass surface to be silvered. Agitate the mixture for about 7 minutes, in which time the process should be completed.

The silver deposit is thin and may show some pin holes. To improve the deposit the glass is removed from the bath, carefully washed with water, using a sponge, but taking care not to scratch the surface. The silvering process is then repeated, using only half of the amount of solutions. The glass is washed repeatedly to remove every trace of the solutions.

It is advisable to do some experimental work on a small scale, since the amount of solution C to be taken depends on the temperature of the solutions and of the room.—J. B. K.

QUESTION 82.—METHOD OF RECOVERY OF SILVER FROM SILVERING SOLUTIONS. Please describe a method of recovering silver from exhausted silvering solutions which have been used in mirror making.

ANSWER: To the solutions containing silver add strong hydrochloric acid. This precipitates the silver as silver chloride. Allow the precipitate to settle and pour off the supernatant liquid. Wash the residue first with hot nitric acid, then several times with hot water. The silver chloride is then converted into silver nitrate as follows: Add 20 per cent caustic soda solution to the silver chloride and heat to boiling. Then add dextrose in small amounts. This precipitates the silver as grey, metallic silver in powder form. Pour off the liquid, wash the silver several times with hot water and finally add nitric acid, which dissolves the silver.

Evaporate to dryness. If the silver is pure, the residue will be pure silver nitrate which can be used again in the silvering process.

Many glass manufacturers collect the silver chloride and sell it to chemical concerns, rather than recover the silver nitrate themselves.—J. B. K.

QUESTION 83.—REASONS FOR BOTTLING VOLATILE FOODS IN BROWN BOTTLES.—What are the reasons for bottling volatile foods in brown bottles and is brown glassware superior to white for this purpose? Have you any information on this subject that you could furnish me?

ANSWER: Brown glass has the property of keeping out certain light rays which are chemically active. Foods that may be acted upon by light should therefore be kept in brown bottles rather than in those made of green or white glass.

Certain kinds of beer are known to keep better in brown bottles than in glass of other colors and for this reason some brewers use only brown bottles for their product. Brown glass is used extensively for the preservation of chemicals that are acted upon by light such as nitric acid, silver nitrate, etc.—J. B. K.

QUESTION 84.—ETCHING FORMULA FOR LIME GLASS. Can you advise what is the best formula for acid etching lime glassware?

ANSWER: The following formula gives a very fine matt etching:

500 parts of ammonium fluoride;
500 parts of ammonium fluoride;
50 parts of ammonium sulphate;
100 parts of sulphuric acid.

This mixture should be made up in a lead vessel, or wooden trough lined with sheet lead. It should be heated until the solution is clear and then cooled rapidly.

This solution should give a good etch in 5 minutes. If this is not the case, add more hydrofluoric acid to the mixture.

For deep etching dilute hydrofluoric acid is used, one part of 50 per cent acid to 5 parts of water. The following mixture may also be used:

1 part of hydrofluoric acid—50%;
3-10 parts of water;
1 part of sulphuric acid.

The solution is kept in a lead lined vessel, and the glass object is dipped into the tank for a few minutes. It is then transferred to a vessel containing water and vigorously rubbed with a brush, to remove the precipitated salts. This may be repeated until the desired result is obtained. Rubber gloves should be worn by the operator.

The glass surface should be cleansed thoroughly before dipping the objects in the etching bath. This can be accomplished by washing the glass with soap and dilute alkali. Oakite washing powder, which can be obtained from the Oakley Chemical Co., New York, has been found to be very effective.—J. B. K.

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NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

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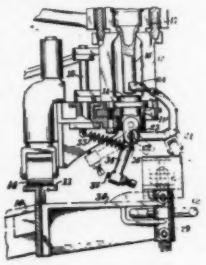
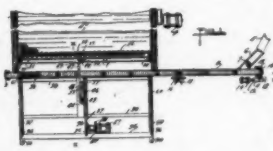
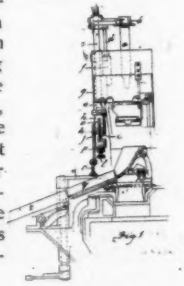
BLANK-CENTERING DEVICE FOR GLASS-FORMING MACHINES. U. S. 1,557,850. Oct. 20, 1925. Richard La France, Toledo, O., assignor to the Owens Bottle Co. Filed 5/2/23. In a glass forming machine, the combination of a traveling carriage, means thereon to support a bare blank of plastic glass at one end, a positioning device arranged to engage the blank adjacent its unsupported end and counteract any tendency of the blank to be thrown out of normal position, automatic means to withdraw said device from the blank, and a mold to enclose the blank after said device has been withdrawn.



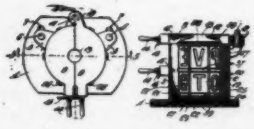
LEHR-CHARGING MECHANISM. U. S. 1,558,691. Oct. 27, 1925. Joseph McDermott, Toledo, O. Filed 7/23/24. A lehr comprising a first conveyor therethrough, a transverse second conveyor thereinto in position adjacent said first conveyor, and an independent transfer device shiftable relatively to said two conveyors into position at an end of the lehr and alongside the second conveyor, said transfer device embodying a pusher for moving ware from the second conveyor to the first conveyor as shown in the horizontal sectional view.



APPARATUS FOR FEEDING MOLTEN GLASS. U. S. 1,558,790. Oct. 27, 1925. Harry B. Chalmers, Yarroville, Australia, assignor to Hartford-Empire Co. Filed 6/4/23. An apparatus for feeding molten glass wherein a container is provided with an outlet for molten glass which is controlled by a reciprocating needle having a fixed connection with guide shafts supported reciprocating in bearings, a sleeve extension on one of the guide shafts, a resiliently mounted abutment supported by said extension, and means for placing the said abutment in the path of movement of the guide shaft upon each alternate movement of the needle to vary the sizes of charges delivered from the feeding apparatus.



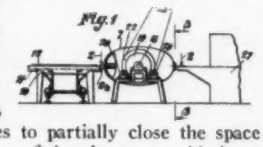
MOLD FOR MAKING GLASS SIGN PLATES. U. S. 1,559,394. Oct. 27, 1925. Josiah H. Williams, Baltimore, Md. Filed 5/4/23. An object of the invention is to provide a mold wherein a large number of sign plates may be made in a single operation directly from the crude glass by the "blowing" process. A multi-sided bottle may be blown, each side of which bottle forms one or more sign plates adapted to be separated by division of the sign bearing portions of the glass from each other, and in which the glass plates so produced are also so formed as to facilitate their separation from each other.



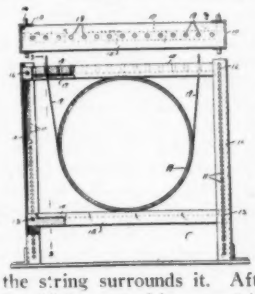
MACHINE FOR GROOVING GLASS. U. S. 1,558,167. Oct. 20, 1925. Gerardus P. Herrick, New York, N. Y. Filed 12/8/21. A machine for cutting a groove in the edge of a lens.

PROCESS OF ETCHING GLASS OR THE LIKE. U. S. 1,556,796. Oct. 13, 1925. Clarke C. Minter, New York, N. Y. Filed 5/27/21. The process of etching glass or the like comprising heating the glass to a temperature approximately 300° C. or above, heating an alkali salt of carbonic acid (as sodium carbonate) to at least the fusion of said salt, and causing contact of said fused salt with the surface of said glass.

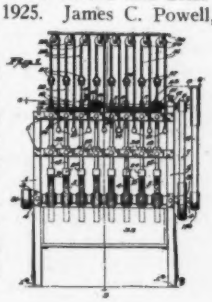
PROCESS AND MACHINE FOR FIRE-POLISHING GLASS. U. S. 1,559,094. Oct. 27, 1925. Joseph Hastreiter, Morgantown, W. Va. Filed 4/22/25. In a glass working apparatus, the combination with a polishing table and a lehr, of a drum intermediate the table and lehr, said drum having two interior flat walls closely spaced and enterable from one side, means on the opposite sides to partially close the space between said walls, and means for confining heat on said drum adjacent said walls.



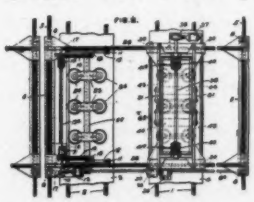
CYLINDRICAL GLASS CUTTER HOLDER. U. S. 1,559,477. Oct. 27, 1925. Jackson R. Uhler, Tatamy, Pa. Filed 5/13/24. The object is to provide a means for holding a cylinder of glass while it is being cut, and means for cutting the glass comprising a cutting string formed to make one complete turn around the glass, the holder for the glass being so formed as to guide this string and prevent its cutting out of proper position, and being also so formed as to permit the ends of the string to be readily manipulated to oscillate the string and thus frictionally heat up the glass at the point where the string surrounds it. After being sufficiently heated the glass is withdrawn and immersed in cold water, which causes it to break at the place desired.



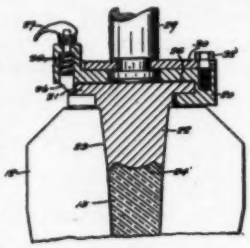
MACHINE FOR POLISHING OR GRINDING GLASS KNOBS AND SIMILAR ARTICLES. U. S. 1,559,643. Nov. 3, 1925. James C. Powell, Byesville, O., assignor to Cambridge Glass Co. An improvement in machines which can be used to polish or grind knobs or similar articles by means of rotating wheels. A series of holders are continuously rotated which through the action of gravity, maintain the work against the polishing or grinding wheel, the holders being independent of one another and being formed to allow the work to be easily and quickly applied to and removed therefrom during the operation of the machine.



PROCESS AND APPARATUS FOR SURFACING SHEET GLASS. U. S. 1,559,862. Nov. 3, 1925. John H. Fox, of Pittsburgh, assignor to Pittsburgh Plate Glass Co. Filed 10/29/23. The apparatus is designed particularly for picking up glass from one car or carrier upon a track, turning it over, carrying it to another car or carrier on a second parallel track and depositing it upon such other car or carrier. Also the provision of means operating in conjunction with the turnover apparatus for pressing the glass sheets, which have been turned over, down into the plaster which secures them to the cars or carriers.

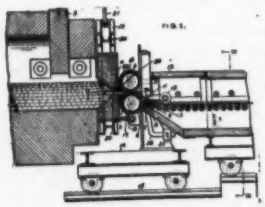


GLASS-MOLDING APPARATUS. U. S. 1,559,854. Nov. 3, 1925. Albert N. Cramer, Toledo, O., assignor to the Owens Bottle Co. Filed 12/16/20. The charge is introduced through the open upper end of the inverted mold. A closing head or plate is then brought down onto the mold to close the same. Air under pressure is introduced at the lower end of the mold to expand the glass against the walls of the mold and said closing head. The invention includes in a glass forming machine, the combination of a mold open at one end to receive its charge, a closure for the mold, a head carrying said closure, a detent by which closure is locked to the head, and means to withdraw said detent, the closure being thereby released and free for instantaneous removal from the head.



APPARATUS FOR MAKING GLASS SHEETS. U. S. 1,560,077. Nov. 3, 1925. Frederick Gelstharp, Tarentum, Pa., assignor to Pittsburgh Plate Glass Co. Filed 1/23/22. In apparatus for forming sheet glass, a tank having in its vertical side wall a feed slot having its lower edge below the surface of the glass and its upper edge above such surface, a pair of cooled rolls arranged one above the other spaced apart in opposition to the slot and under the head pressure of the tank so that the space between the rolls constitutes the outlet of the slot, means for rotating the rolls, and a severing device between the rolls and leer adapted to pass across the sheet in opposition to said support and sever it while still plastic.

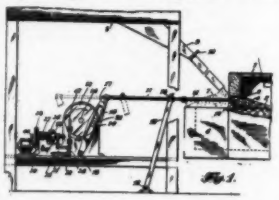
APPARATUS FOR MAKING SHEET GLASS. U. S. 1,560,078. Nov. 3, 1925. Frederick Gelstharp, Tarentum, Pa., assignor to Pittsburgh Plate Glass Co. Filed 5/7/23. Has for its principal objects the provision of means, (1) for improving the edges of a continuous ribbon or sheet of glass, (2) for eliminating the bubbles which are at times introduced into the sheet intermediate the clay outlet slot from the tank and the rolls, (3) for eliminating the slight upturning of the extreme edges of the sheet which tends to occur intermediate the rolls and the lehr, (4) and for mounting the slot member of the tank so that it may be readily removed and replaced or adjusted vertically.



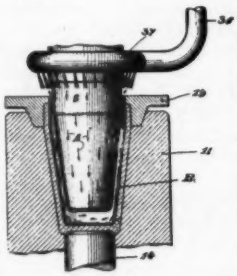
METHOD AND APPARATUS FOR MAKING SHEET GLASS. U. S. 1,560,079. Nov. 3, 1925. Frederick Gelstharp, Tarentum, Pa., assignor to Pittsburgh Plate Glass Co. Filed 8/8/1923. A method of manufacture of sheet glass which comprises melting and maintaining in a tank furnace a reservoir of molten glass supplying the glass laterally by the head pressure within the tank to a sheet forming pass between rolls one above the other arranged to control its rate of flow from the tank, said pass being of dimensions adapted to form the finished sheet, cooling the rolls internally, rotating the rolls, and continuously forming a sheet of substantially uniform thickness throughout and feeding it forward, and causing the lower surface of the sheet in its travel from the roll pass to continue in contact with the surface of the lower roll.

APPARATUS FOR MAKING SHEET GLASS. U. S. 1,560,080. Nov. 3, 1925. Frederick Gelstharp, Tarentum, Pa., assignor to Pittsburgh Plate Glass Co. Filed 8/8/23. One object is the provision of an arrangement permitting the formation of a continuous sheet or ribbon of glass having a relatively high temperature at the period of formation. This is a desirable method of procedure, as there is less elongation of any bubbles or seed present in the glass, if such glass, as it passes between the rolls, is relatively hot and fluid, than if the glass is stiffer. This is so, as the rolling operation tends to flatten and elongate the bubbles against their normal tendency to assume a spherical shape, and after the sheet has passed the rolls, this tendency is still exerted and the bubbles or seed resume their original spherical form (either partially or in whole), if the glass is not too stiff to prevent it. The difficulty involved in operating under these conditions is that the sheet will not maintain the shape and cross section to which it is sized by the rolls, if the glass is too soft, and the present invention is designed to overcome this difficulty by the provision of means for chilling the lower surface of the glass and supporting it until the glass has set sufficiently to keep its shape after it passes onto the forwarding rolls in the lehr, or leading to it. Such chilling means comprises a hollow metal table, preferably cooled by the circulation of a fluid, such as water, therethrough.

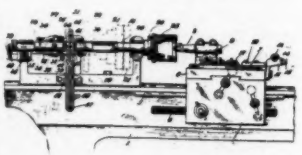
FURNACE FEED DEVICE. U. S. 1,560,070. Nov. 3, 1925. William McNamara, Connellsville, Pa., assignor to Capstan Glass Co. A device comprising in combination a glass furnace or the like provided with a charging opening, a scraper mounted for longitudinal movement adjacent said opening, means for imparting to said scraper a reciprocating movement in a predetermined curved path to push material through said opening into said furnace and means to vary the path through which said scraper moves during its scraping movement.



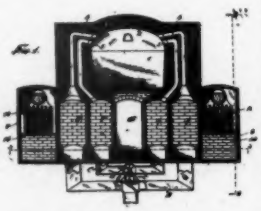
METHOD AND APPARATUS FOR COOLING GLASSWARE AND THE LIKE. U. S. 1,560,062. Nov. 3, 1925, Peter Kucera, Pittsburgh, Pa., assignor to Capstan Glass Co. Filed 3/12/20. The method of cooling pressed glassware and the like which comprises forming an article by pressing a suitable charge between movable shaping members, withdrawing certain of the shaping members from the finished article and maintaining a blast cooling medium directed between the article and the withdrawn member during the time the member is leaving the article and with the space between the article and the withdrawn member open to atmosphere.



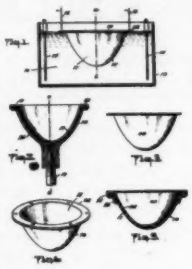
FORMING MACHINE. U. S. 1,560,064. Nov. 3, 1925. Peter Kucera, South Connellsville, Pa., assignor to Capstan Glass Co. Relates to devices for use in manufacturing block molds for glass machines for forming shapes and comprises a pattern, a tool guided by said pattern, a taper bar to cause said tool to vary laterally from the normal path of the tool as controlled by said pattern, means to adjust said taper bar, a travel control lever for controlling the effective length of the pattern, and means to adjust said lever to predetermine the effect thereof upon the final form.



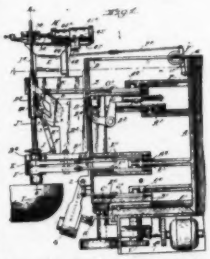
METHOD AND APPARATUS FOR CONSERVING HEAT FOR INDUSTRIAL FURNACES. U. S. 1,506,063. Nov. 3, 1925. Peter Kucera, Connellsville, Pa., assignor to Capstan Glass Co. Filed 8/14/20. The principal object of the invention is to provide a method and apparatus for utilizing hot gases after they have finished their useful work in an industrial furnace by conserving the energy from such gases before the gases have materially dropped in temperature. A specific object is the provision of a method and apparatus for utilizing waste hot gases from a continuous glass furnace or the like by providing a plurality of steam generators arranged in such manner that one of the generators may be at all times in the path of the hot gases when the direction of the gases through the furnace is alternated, and wherein fresh fuel may be supplied to the generator which is not in the path of the hot gases in such manner that the generator and furnace may be run either independently or in conjunction with each other.



METHOD OF GRINDING GLASS MOLDS. U. S. 1,560,033. Nov. 3, 1925. Blasius Bart, East Orange, N. J. Filed 1/11/23. An improved method, for accurately forming, or rather truing by a grinding operation, articles which are required to have an accurately designed configuration such as glass molds used in forming metallic reflectors of the type generally termed parabolic reflectors and which are required to be accurately formed. The object of the invention is attained by depositing of metal as fine particles on the mold surface either by an atomized stream of metal on the mold, or preferably, by forming on the mold a thin metal coating by electrolytic precipitation. A beautiful polish is formed on the treated surface of the mold with the result that when a silver deposit, for instance, is electrolytically positioned on the polished mold surface, there is produced a reflecting surface of intense brilliancy with an extremely high reflecting capacity.

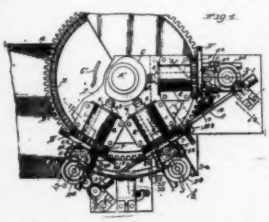


MECHANISM FOR MAKING GLASS CONTAINERS. U. S. 1,560,158. Nov. 3, 1925. Warren C. Glaspey, Bridgeton, N. J., assignor to Spring Stopper Co. Filed 10/22/23. The primary object is to provide a machine with mechanism for forming an internal thread in the mouth of the container. It includes a mandrel having a thread-equipped tip and having a threaded shank, means for raising and lowering the mandrel-head, and means for effecting rotation of the mandrel while permitting longitudinal movement of the mandrel.



It is for use in combination with a dipping head, a neck mold associated with said dipping head and a gathering associated with the neck mold, a mandrel-head having a tubular member extending into a bore with which the dipping head is provided.

MACHINE FOR MAKING BOTTLES, ETC. U. S. 1,560,159. Nov. 3, 1925. Warren E. Glaspey, Bridgeton, N. J., assignor to Spring Stopper Co. Filed 8/2/24. A machine for making bottles, or similar containers, which are provided within the mouth-portion with an internal screw thread; the primary object is to provide improved means for actuating the mandrels in a machine of this character. It includes the combination of a mold, an associated nut, a tubular mandrel working through said nut and equipped at its lower end with a clutch-member, a vertically movable clutch-member equipped with a spring-held centering pin, and means for effecting rotation of said second-named clutch-member, said centering pin being provided with an air passage therethrough.



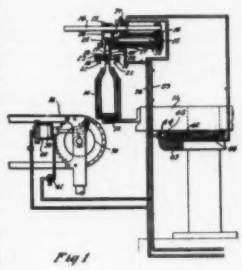
APPARATUS FOR ANNEALING GLASSWARE. U. S. 1,560,481. Nov. 3, 1925. Vergil Mulholland, West Hartford, Conn., assignor to Hartford-Empire Co. Filed 6/1/25. An improvement upon the lehr disclosed in copending application serial No. 19,615, filed March 31, 1925, for annealing glassware, comprising a tunnel, a heating flue and a cooling flue associated with said tunnel, means for causing heating and cooling media to flow through said flues at subatmospheric pressure, and means located at intervals along said flues for controlling the temperature therein.

One object is to provide a lehr, of the character described, which shall be of relatively light and inexpensive structure, which may be quickly and easily assembled from a plurality of similar cast iron sections, and in which the temperature in the tunnel may be easily and accurately controlled and maintained substantially uniform.

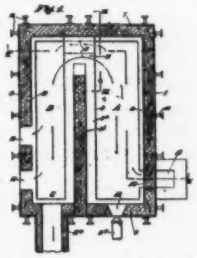
Another object is to provide a lehr in which the heating and cooling media, flowing in their respective flues, shall be drawn through the flues by suction and shall thus be prevented from obtaining access to the tunnel through leaks or crevices that may exist or develop between the flues and the tunnel.

A further object is to provide a lehr embodying a substantially unitary tunnel mounted on rollers or other equivalent anti-friction devices in order to permit the tunnel to expand and contract as an entirety in a longitudinal direction with changes in temperature.

TAKE-OUT DEVICE FOR BOTTLE-BLOWING MACHINES. U. S. 1,561,451. Nov. 10, 1925. James W. Lynch, Alexandria, Ind., assignor to Lynch Glass Machinery Co. Filed 3/2/22. The inventor claims in a glass working machine, a movable table and series of molds carried thereby, means for opening said molds at a predetermined point in their movement, a conveyor adjacent said point, and a take-out device for transferring glass ware from said molds at said point to said conveyor, the take-out device comprising a laterally movable carrier, a vertically movable yoke mounted thereon, and arms carrying grippers at their outer ends pivotally connected to said carrier intermediate their ends and to said yoke at their ends remote from the grippers.



MELTING FURNACE. U. S. 1,561,393. Nov. 10, 1925. William A. Yung, Pittsburgh, Pa. Filed 4/15/25. An object is the provision of a furnace so designed as to materially reduce the radiating surface of the molten mass, to utilize the maximum number of heat units from the fuel and to provide a furnace in which the refined molten mass of glass is separated from the partly melted stock in the furnace, thereby improving the quality of glass.



It consists of a melting furnace comprising a substantially rectangular body portion, a wall dividing said furnace into two melting chambers, and having separate openings one end for the passage of the melted material and products of combustion from one chamber to the other, a fuel burner, an outlet port for the products of combustion, and work openings for the removal of the melted material.

A Modern Mold, Machine and Foundry Service

Many glass men who are not familiar with the plant of the Washington Mould, Machine & Foundry Company at Washington, Pa., would, if they were to make a similar inspection, be as surprised as was a representative of this paper when he visited their foundry and machine shops recently and observed the modern, complete and extensive equipment for manufacturing not only glass molds, but also for rebuilding and repairing all kinds of glassworking machinery.

A few weeks ago this company, which began business nine years ago with three employes, was incorporated with a capitalization of $200,000. It now has 75 employes on its pay roll regularly. W. M. Crile, general manager of the company, attributes the success of the enterprise largely to the fact that the management and workmen are all experienced men in mold making and other special lines, he himself having spent 10 years in that line and, previously, five years in a glass factory, before the present business was established. Mr. Crile emphasized the fact that the company is an independent one and in a position to serve any glass manufacturer efficiently, confidentially and faithfully.

The company's plants include the most modern types of machinery and their lathes, planers, boring mills and other equipment are of sufficient capacity to enable them to make and machine even the largest castings involved in the repair and rebuilding of glass making machinery of all kinds. The advantage to the glass manufacturer of having all operations completed in one plant, thus concentrating responsibility, is obvious.

The Glass World and What It Is Doing

News of the Industry

Get Ready for the Biennial Census

The Bureau of the Census is making plans for the next biennial census of manufactures, which will cover the year 1925, as provided in the Act of Congress approved March 3, 1919.

The bureau has asked the aid of trade journals and associations in securing cooperation in collecting the data for the census, and attention is directed to the following statement:

The blank forms upon which reports should be made will be mailed by the bureau to all manufacturers about January 1, and a report will be required from each manufacturer whose gross products are valued at $5,000 or more for the year 1925. It is to be hoped that every manufacturer concerned will have his records in such shape that he can fill out the schedule within a few days after its receipt, as the tabulation of each industry will be delayed until the Bureau of the Census receives reports from all manufacturers engaged in it. We therefore urge our readers to furnish this information, in case they are manufacturers, soon after January 1 in order that as early as possible in 1926, the statistics which will show the condition and record of the glass industry for the year 1925 may be available.

Atlanta Meeting of American Ceramic Society

The annual meeting of the American Ceramic Society, which is to be held at the Hotel Biltmore, Atlanta, Ga., February 8 to 13, inclusive, promises to be an interesting occasion. Secretary Ross C. Purdy has announced that divisional meetings will be held on Tuesday, the 9th, and Wednesday, the 10th, and a general session of the society will be on Thursday forenoon for the presentation of papers of general interest. Four one-half day sessions of the Glass Division will be held and will include:

1. Popular talks on glass; 2. Papers and discussions in non-technical language for the benefit of manufacturers; 3. Technical papers of a purely scientific nature; 4. A symposium with another division of the society.

The nominating committee has chosen the following members to serve on the board of trustees for 1926; R. L. Clare, president; B. M. Hood, vice-president; H. B. Henderson, treasurer, and for division representative: glass, J. C. Hostetter, and white wares, A. V. Bleininger.

Ball Brothers Buy Schram Plants

Ball Brothers Company, Muncie, Ind., has announced the purchase of the plants owned by the Schram Glass Manufacturing Company, at Hillsboro, Ill., Sapulpa, Okla., Huntington, W. Va. These factories will be operated from Muncie in connection with the glass plants of the Ball Brothers Company at Muncie and Wichita, Tex. The acquisition of the Schram plants, which are equipped with automatic machinery, will, it is said, put Ball Brothers in a position to extend their production to the manufacture of lines of glassware which were not included in the license covering their equipment of Owen's machines, which has limited them to the making of fruit jars and certain other articles, for which there is only a demand at certain seasons of the year.

The amount of money involved in the transaction was not made public, but will, it is believed, run above a million dollars.

Lancaster Glass Absorbs Gill Brothers Company

The old established business of Gill Brothers Company, of Steubenville and Toronto, Ohio, with its goodwill, equipment, etc., has been taken over by the Lancaster Glass Company, Lancaster, Ohio, and will be continued as a new unit of that company. John Beiswanger, who, for many years has been associated with Gill Brothers Company, and for the past 10 years has been vice-president and general manager, will be in direct charge and supervise operations.

The same general business policy will be continued and the same high standard of quality, which has marked the success of that company for the past 50 years, will be maintained. Lead glass and lamp chimneys will be produced as heretofore in all styles and sizes now in general use. The manufacture of plain and decorated shades and the regular line of opal dome shades for use with kerosene and gasoline mantle lamps will be continued.

To these lines will be added silvered glass reflectors, gas and lantern globes, lamps and founts.

Mathieson Alkali Branch Office at Fairmont

The Mathieson Alkali Works (Inc.), 250 Park avenue, New York, announces the establishment of a new district sales office in Fairmont, W. Va., with W. C. McAdoo in charge as district sales manager.

The territory to be handled by the new Fairmont office includes nearly all of West Virginia, the southwestern section of Pennsylvania, and a number of cities located on the Ohio side of the Ohio River. In the past this has been a part of the Philadelphia office territory and it is felt that the new arrangement will prove to be of mutual advantage to the Mathieson Company and to its customers.

Mr. McAdoo has been covering this section during the past year and has gained the confidence and esteem of his customers and friends with whom he has come in contact. The company will continue to carry at Fairmont complete warehouse stocks of "Eagle-Thistle" products for prompt delivery to local consumers.

Glass Company Gives Wage Increase

The Pennsylvania Wire Glass Company, Dunbar, Pa., on November 14, announced through Wm. Stevenson, superintendent, that effective December 1 the company would increase the pay of all employees five cents an hour.

About 200 men are affected. The lowest wages paid by the company hereafter will be 50 cents an hour for common labor. The skilled employees of the company and those who have been in the service for a long period receive much higher wages.

The new addition to the company's plant at Dunbar is about completed and will, it is expected, be put in use about January.

Production of Plate Glass in October

More polished plate glass has been produced during the first 10 months of this year than was ever manufactured in the United States in any full 12-month period. The figure given out by P. A. Hughes, secretary of the Plate Glass Manufacturers of America, covering the production for the month of October was 10,713,640 sq. ft., as compared with 10,296,734 sq. ft. in September and 10,328,029 sq. ft. in August, and making a total production for the first ten months of 1925, 97,828,776 sq. ft.

The total production in 1924 was a little in excess of 90,000,000 sq. ft.

Goes to Russia to Install American Equipment

Peter Kucera, of the Simplex Engineering Company, formerly connected with the United States Glass Company and Capstan Glass Company, sailed on November 28, for Europe, on his way to Russia. At Moscow, he will establish headquarters and supervise the construction of Simplex lehrs in three bottle factories now being built in different locations, contracts for which were placed with the Simplex company a short time ago through Amtorg Trading Corporation, New York, representatives in the United States for the Union of Socialist Soviet Republics.

Eastern Glass Distributors' Meeting

The meeting of the Eastern Division of the National Glass Distributors' Association at New York on Nov. 11 disclosed a very hopeful attitude on the part of the members in attendance as to the outlook for the winter season. Improved conditions in the trade were noted. Stocks on hand are short of some sizes. Plate and window glass importations were reported to be falling off, which may indicate that since the 25 per cent reduction in plate glass prices the profit on foreign glass is small. In fact, as brought out in the report of the Tariff hearing at Washington, published elsewhere in this issue, the importers claim that on small sizes of plate they are losing money.

Owens Bottle Declares Extra Dividend

An extra cash dividend of $1 per share and 5 per cent in comstock have been declared on the common stock of Owens Bottle Co., in addition to the regular quarterly disbursement of 75 cents. The regular quarterly payment of $1.75 on the preferred also was authorized, all payable January 1, to stock of record December 16.

There are 660,506 shares of common stock of Owens Bottle Co. outstanding, and this means that the regular dividend requirements per quarter are $495,378, and that the extra cash will add $60,506.

The stock dividend will mean the distribution of 33,025 shares to the common stockholders and these shares at present market prices are worth about $2,146,625 on a basis of $65 a share.

There are 81,705 preferred shares outstanding and the regular dividend on these amounts to $142,983.

Earnings of the Owens Bottle Co. have broken all records this year and are far in excess of what they were a year ago.

New Window Glass Discounts

The American Window Glass Company on November 2 announced new carload discounts on window glass, supplanting those of May 16, 1925, and October 9, 1925. The new rates advance prices slightly on the higher qualities. Additional boxing charges of from one to four cents were also listed.

John Gayner, founder and president of the Gayner Glass Works, Salem, N. J., died on October 22 at the age of ninety-four.

Trade Activities

Turner Bros. Company are operating all three tanks at Winchester, Ind., as well as their large tank at Terre Haute.

The Hart Glass Manufacturing Company, Dunkirk, Ind., have completed repairs on their small tank and it is now in operation.

Killmer Paint & Glass Company, Inc., Tulsa, Okla., capital $10,000, has been incorporated by A. M. White and Charles L. Yancey.

The Obear-Nester Glass Company, East St. Louis, Ill., have just closed down their large flint tank after a very successful run of 15 months.

The Independent Glass Company, Chattanooga, Tenn., has been incorporated by Edgar Hill and Charles Toches with a capital of $10,000.

D. Diamond Glass Company, Perth Amboy, N. J., capital $100,000, has been incorporated by Walter G. Leonard and David B. Goldstein.

The Fostoria Glass Company, Moundsville, W. Va., suffered slight damage to its plant when a fire started in the etching room on November 6.

The Perfect Glass Company, Cameron, W. Va., has been incorporated with a capital of $50,000 by William M. Cruse and Robert M. Johns, both of Wheeling, W. Va.

Binswanger & Company, glass distributors of Richmond, Va., and Memphis, Tenn., according to a report, have established the **Binswanger Glass Products Company,** Miami, Fla.

The Technical Glass Company, Los Angeles, Cal., was badly damaged recently by a fire resulting from the bursting of a tank.

The Weston Glass Company, Weston, W. Va., are building a new continuous tank. J. F. Cone of Clarksburg, W. Va., is in charge of the construction work.

The Newborn Glass Company's plant at Royersford, Pa., is reported to have been sold at sheriff's sale for $34,600 to Harry I. Hiestand, an attorney representing the Royersford Trust Company.

The Western Glass Company is reported to have resumed operations at their Shirley branch which has been inactive over a long period. This company manufactures rough rolled, ribbed and wired plate glass.

Hansen, Sommer & Maca, Inc., who recently changed their corporate name to the Sommer & Maca Glass Machinery Corporation, are now operating their new factory at 3600-3608 South Oakley avenue, Chicago, Ill.

The G & F Hardware & Glass Company, New York City, has been incorporated by H. Feldman, C. Genberg and W. K. Dorfman with a capital of $10,000. H. H. Benjamin, 303 Fifth avenue, New York, is attorney.

The Pennsylvania Wire Glass Company, Dunbar, Pa., through William Stevenson, superintendent, announces that a voluntary increase in the wages of their workmen of from 10 to 20 per cent was made effective November 1.

C. Dorflinger & Sons glass factory at White Mills, Pa., and surrounding buildings, were sold by Walter M. Fowler, trustee, to the John C. Wellwood Corporation, silk manufacturers, for a consideration reported to be around $100,000.

The Graham Mirror & Glass Works, 1138 East Jefferson street, Kokomo, Ind., a new industry for that city, is being operated by Roscoe E. Graham. The company will manufacture beveled mirrors, table tops, auto wind deflectors, resilvering of mirrors, etc.

Announcement was made November 5 that the Bondbolders' Protective Committee, representing the **Interstate Window Glass Company's** five-year 8 per cent sinking fund gold bonds, has extended to December 31, the time within which bonds may be deposited under the agreement.

The Diamond Glassware Corporation has been incorporated at Indiana, Pa., by H. W. Thomas, C. E. Dinkey, Jr., C. M. Schwalb, C. E. Dinkey, Sr., and D. B. Taylor, to manufacture colored, decorated and flint glassware. This is a reorganization of the Diamond Glassware Company.

The Mirror Manufacturers' Association will hold its annual meeting on December 8 and 9, at the William Penn Hotel. Harry C. Sorden, secretary of the association, urges a large attendance, as it is one of the most important meetings of the year. He states that the usual suite on the fifteenth floor of the hotel has been engaged for the conference.

The Coshocton Glass Corporation, Coshocton, O., has resumed operations after being shut down since July. According to J. C. Landkrohn, secretary and treasurer, orders for articles such as graduated egg beaters, bowls, salad plates, candlesticks, etc., in crystal and iridescent finish are being received in large quantities and a satisfactory run seems assured.

The Botfield Refractories Company, Philadelphia, Pa., is exhibiting at the Fourth National Exposition of Power and Mechanical Engineering being held at the Grand Central Palace, New York, November 30 to December 5, a number of examples of fire brick construction laid up with Adamant fire brick cement and data on the service of Adamant laid brickwork.

The Standard Silica Company of Ottawa and Chicago, Ill., manufacturers of Blackhawk brand glass, steel molding and foundry sand, have announced the purchase of the Crescent Silica Company of Ottawa. By this purchase the Standard Company acquires 82 acres of land in the heart of the Ottawa district with a modern concrete and steel washing and drying plant and other equipment which will double their production capacity.

Three Rivers Glass Company, Three Rivers, Tex., have enlarged thir factory buildings and doubled the capacity of the plant. The melting tank has been increased to a capacity of about 22 tons of finished bottles per day, an additional lehr has been constructed and a new 150 h.p. gas engine installed. The company also announces that the Simplex Engineering

Company, Washington, Pa., recently began working out preliminary plans for an additional 50 ton tank.

The Scohy Sheet Glass Company, Sistersville, W. Va., through John B. Scohy, president, announced early in November that their plant was operating at full capacity and very successfully producing polished glass by the Fourcault process. Experienced workers, including a representative of the Belgian Fourcault company are associated with the Scohy Company. Mr. Scohy also announces that he expects to add a large new unit to their plant in the near future.

Personals

R. G. Yost has been appointed purchasing agent for the United States Glass Company, Pittsburgh, Pa.

Emery G. Ackerman recently became connected with the Monongah Glass Company, Fairmont, W. Va., in the capacity of production manager.

J. M. Belleville, traffic manager of the Pittsburgh Plate Glass Company, was recently elected chairman of the executive committee of the National Industrial Traffic League.

Karl Core, for several years superintendent of the Ford City, Pa., plant of the Pittsburgh Plate Glass Company, was recently placed in charge of all construction work for the company, with offices in Pittsburgh.

Joseph C. Brady, president of the Hazel-Atlas Glass Company, Wheeling, W. Va., was elected to be one of the vice-presidents of the West Virginia Manufacturers' Association, at its annual meeting recently held in Fairmont, W. Va.

T. E. Kirch, formerly with the Miller Glass Engineering Company, Swissvale, Pa., is now with the engineering department of the Nivison-Weiskopf Company, bottle manufacturers, Reading, O. This company is operating at full capacity.

A. F. Bathurst, formerly mechanical superintendent of the Crown Cork & Seal Company, Baltimore, Md., and general foreman of the American Type Foundry Company, Jersey City, N. J., is now connected in the capacity of superintendent of William J. Miller, Inc., Swissvale, Pa., manufacturers of glass working machinery.

D. K. Albright, general manager of the Glassmere Plate Glass Plant of the Ford Motor Company, is taking a long holiday in Maryland. It has been stated on good authority that Mr. Albright, desiring to enjoy a good rest, recently handed in his resignation, which, however, was not accepted, a six-months' leave of absence being presented to him instead.

William Smeddle has become associated with the Simplex Engineering Company, Washington, Pa., in the capacity of chief engineer. Mr. Smeddle, who has had long experience in various lines, was for the past twelve years connected with the Ford Motor Company, Detroit, Mich., first as a gas engineer specializing in gas producers and power plant work and for the past seven years associated in the development of the Ford continuous method of making polished flat glass. Mr. Smeddle has also been chief draftsman with the Chapman engine work and the Westinghouse company.

What Our Advertisers Are Doing

The Pierce Glass Company, 665 Main street, Buffalo, has awarded a contract for a new warehouse building to be erected at Port Alleghany, Pa. **The Austin Company,** engineers and builders, Cleveland, O., are furnishing the building of steel frame construction which is to be erected by the owner's own forces. The Pierce Glass Company manufactures molded glass, principally bottles. V. M. Pierce, Buffalo, is president, and H. C. Herger, at Port Allegany, is secretary.

Coming Meetings

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS will hold its annual meeting in New York, November 30 to December 4, 1925.

THE MIRROR MANUFACTURERS' ASSOCIATION will hold its annual meeting at the William Penn Hotel, Pittsburgh, Pa., December 8 and 9.

THE FOURTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING will be held at the Grand Central Palace, New York, November 30 to December 5.

ASSOCIATED GLASS AND POTTERY MANUFACTURERS AND PITTSBURGH GLASS AND POTTERY EXHIBIT, January 11 to 30, 1926, at Pittsburgh.

AMERICAN CERAMIC SOCIETY annual meeting will be held at Atlanta, Ga., February 8-13, 1926.

THE STAINED GLASS ASSOCIATION OF AMERICA, formerly the National Ornamental Glass Manufacturers Association, will hold its next annual convention next summer in Washington, D. C.

What the World Wants

(Specific inquiries for American goods received in the Dept. of Commerce)

Venezuela. 17597, bottles; 17830, glassware.
Austria. 17774, glass-manufacturing machinery.

Inquiries Received

For Further Information Address THE GLASS INDUSTRY

295. (From Germany.) We intend to install within a short time some automatic glass machines for narrow and wide neck glasses [presumably bottles] and would like to receive detailed description of machinery from manufacturers, quoting price delivered in Hamburg, terms of payment, also time of delivery. (Nov. 5.)

296. Where can we buy in this country imported heavy pressed lighting bowls of crystal glass roughed, 16 and 20 inches in diameter. (Oct. 31.)

297. I am in the market for lettering work on plate glass and embossed or raised letters on opal glass with sandblast background for use in signs for hotels, banks, etc. (Nov. 9.)

298. We desire names of concerns which are in a position to produce the decalcomania transfer process on glass. (Nov. 9.)

299. Can you give us the names of makers of a special form of cement for affixing glass to glass. (Oct. 31.)

300. We desire to obtain some square towel bars made from opal glass and would ask you to give us names of manufacturers. (Nov. 18.)

301. Can you give us the names of manufacturers of glass caster cups. (Nov. 24.)

302. We want quotations on quantities of a special shaped glass container. (Nov. 14.)

Glass Stock Quotations

Reported by Moore, Leonard & Lynch, Union Trust Building, Pittsburgh, Pa.

PITTSBURGH STOCK EXCHANGE, November 23, 1925

	Bid	*Asked*	*Last*
American Window Glass Machine, common	78	79	78
American Window Glass Machine, pfd	93	93	94
American Window Glass, preferred	109	110	110
United States Glass	17½	18½	17½
Pittsburgh Plate Glass	282	285	282
Standard Plate Glass, common	7⅛	7⅜	7¼
Standard Plate Glass:			
Preferred cumulative	48	52	50
Prior	80	85	82

Glass stocks showed moderately increased demand during November. Plate glass output in the first 10 months of 1925 of 97,828,776 square feet of polished plate exceeded by 5,000,000 square feet, the production for the entire year 1924. There is every indication that output for 1925 will approximate 115,000,000 square feet, making this the greatest plate glass year in history. The specialty companies are also doing well as a reflection of increased Christmas demand.

WHEELING STOCK EXCHANGE, November 23, 1925

Hazel Atlas	37½	38½	38½
Imperial	60	65	65
Fostoria	140	150	150
Central	70	75	75

The Wheeling glass market is very fair. Hazel Atlas is running from 85 to 90 per cent of capacity and is expected to earn its dividend twice in the present year. Future operations are looked forward to with satisfaction.

TOLEDO STOCK EXCHANGE, November 23, 1925

Owens Bottle Machine, common	64	65	65
Libbey-Owens Sheet Glass, preferred	114	115	114
Libbey-Owens Sheet Glass, common	210	218	210

Current Prices of Glass-Making Materials

Quotations furnished by various producers, manufacturers and dealers.

November 23, 1925

		Carlots	Less Carlots
Acid:			
Citric	lb.	.45½	.45½
Hydrochloric (HCl) 20° carb. ext. per 100	lb.	1.65	2.00
Hydrofluoric (HF) 60% (lead carb.)	lb.	..	.13½
52% and 48%	lb.	..	.10-.11½
Nitric (HNO_3) 38° carboy ext. Per 100 lb.		5.00	5.25-5.50
Sulphuric (H_2SO_4) 66°	ton	14.00	15.00
Tartaric	lb.	..	.28-.29
Alcohol, denatured	gal.	.50	.55
Aluminum hydrate ($Al(OH)_3$)	lb.	.05	.05½
Aluminum oxide (Al_2O_3)	lb.	..	..
Ammonium fluoride (NH_4F)	lb.	..	.23
Ammonia water (NH_4OH) 26° drums	lb.	..	.04½
Antimony, metallic (Sb)	lb.	..	.20
Antimony oxide (Sb_2O_3)	lb.	..	.19-.20
Antimony sulphide (Sb_2S_3)	lb.	..	.20
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.03½	.04
Barium carbonate ($BaCO_3$)			
Precipitated	ton	44.00–50.00	47.00–54.00
Natural powdered	ton	42.00–44.00	45.00–46.00
Natural, powdered, imported	ton	38.00	..
Barium hydrate ($Ba(OH)_2$)	lb.	..	.05
Barium nitrate ($Ba(NO_3)_2$)	lb.	.07¼	.08
Barium selenite ($BaSeO_3$)	lb.	..	..
Bone ash	lb.	.05½	.06½
Borax ($Na_2B_4O_7 \cdot 10H_2O$)	lb.	.04¾	.05-.05½
Boric acid (H_3BO_3)	lb.	.09	.09¾
Refined	lb.	.10	.10½
Cadmium sulphide (CdS)—			
Red	lb.	..	1.25
Orange	lb.	..	1.10-1.25
Yellow	lb.	..	..
Chromium oxide (Cr_2O_3)	lb.	.30	.32
Cobalt oxide (Co_2O_3)			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide			
Red (Cu_2O)	lb.	.	.30
Black (CuO)	lb.	..	.25
Black prepared	lb.	..	.30
Cryolite (Na_3AlF_6)	lb.	..	.09½
Epsom salts ($MgSO_4$) (imported) Per 100 lb.		..	1.30
Feldspar—			
100 mesh	ton	11.50-20.00	16.00-22.00
80 mesh	ton	..	..
40 mesh	ton	..	..
Fluorspar (CaF_2)—			
Powdered white, 95%	ton	40.00	..
" " 90%	ton	38.00	..
Formaldehyde	lb.	.08¾	.09½
Graphite (C)	lb.	..	.04-.07
Iron oxide—			
Red (Fe_2O_3)	lb.	..	.02
Black (FeO)	lb.	..	..
Kaolin (f.o.b. mine)	ton	10.00	..
English, lump, f.o.b. New York	ton	14.00-22.00	..
Lead chromate ($PbCrO_4$)	lb.	..	..
Lead oxide (Pb_3O_4) (red lead)	lb.	.12¾	.13
Litharge (PbO)	lb.	.12¼	.12½
Lime—			
Hydrated ($Ca(OH)_2$) (in paper sacks)	ton	12.50	..
Burnt (CaO) ground, in bulk	ton	9.00	..
Burnt, ground, in paper sacks	ton	11.00	..
Burnt, ground, in 280 lb. bbls. Per bbl.		2.15	2.30
Limestone ($CaCO_3$)	lb.	..	..
Magnesia (MgO)—			
Calcined, heavy	lb.	..	.05
Light	lb.	..	.24
Magnesium carbonate ($MgCO_3$)	lb.	.03¼	.03½
Manganese 85% (MnO_2)	lb.	.04½	.05-.06
Nickel oxide (Ni_2O_3), black—			
for nickel content	lb.	..	.35
Nickel monoxide (NiO), green—			
for nickel content	lb.	..	.35
Plaster of Paris, bags	ton	..	19.00
Potassium bichromate ($K_2Cr_2O_7$)—			
Crystals	lb.	.08½	.08¾
Ground	lb.	.11	.12
Potassium carbonate—			
Calcined (K_2CO_3) 96-98%	lb.	.06½	.06¾
Hydrated 80-85%	lb.	.05¾	.06
Potassium chromate (K_2CrO_4)	lb.	..	..
Potassium hydrate (KOH) (caustic potash)	lb.	..	.07½-.07⅝
Potassium nitrate (KNO_3) (gran.)	lb.	.06⅛	.06⅜
Potassium permanganate ($KMnO_4$)	lb.	.14	.16
Powdered blue	lb.	..	.24
Rochelle salts, bbls.	lb.	..	.20-.21
Rouge	lb.	..	..
Rutile (TiO_2) powdered, 95%	lb.	.20	.25
Salt cake, glassmakers (Na_2SO_4)	ton	20.00-22.00	23.00
Selenium (Se)	lb.	..	2.10
Silver nitrate ($AgNO_3$)	oz.	..	.49⅛
Soda ash (Na_2CO_3) dense, 58%—			
Bulk	Flat per 100 lb.	1.35-1.40	..
Bulk, on contract	Flat per 100 lb.	1.35	..
In barrels	Per 100 lb.	1.69	2.40
In bags	Per 100 lb.	1.45	..
Spot orders	.05 per 100 lbs higher		
Sodium bichromate ($Na_2Cr_2O_7$)	lb.	.06½	.07
Sodium hydrate (NaOH) (caustic soda)	Per 100 lb.	3.20	3.90
Sodium nitrate ($NaNO_3$)—			
Refined (gran.) in bbls.	lb.	.03⅞	.04⅛
95 per cent	Per 100 lb.	2.55	2.75
Sodium selenite (Na_2SeO_3)	lb.	..	..
Sodium fluosilicate (Na_2SiF_6)	lb.	.04¼	.05
Sodium uranate (Na_2UO_4)	lb.	..	1.15
Sulphur (S)—			
Flowers, in bbls.	Per 100 lb.	3.35	3.65-3.90
Flowers, in bags	Per 100 lb.	3.00	3.30-3.55
Flour, heavy, in bbls.	Per 100 lb.	2.50	2.80-3.05
Tin chloride ($SnCl_2$)) (crystals)	lb.	..	.43
Tin oxide (SnO_2) in bbls.	lb.	..	.66
Uranium oxide (U_3O_8), 100 lb. lots	lb.	..	1.15
Zinc oxide (ZnO)	lb.	.07½	.07¾

Monthly Summary of United States Foreign Commerce in Glass

EXPORTS

Corrected to October 24, 1925

	September 1924 Quantity	September 1924 Value	September 1925 Quantity	September 1925 Value	Nine Months Ending September 1924 Quantity	Nine Months Ending September 1924 Value	Nine Months Ending September 1925 Quantity	Nine Months Ending September 1925 Value
Glass and glass products (total)	.....	$681,171	.....	$672,861	.....	$6,566,909	.....	$6,458,545
Plate and window glass—								
Window glass, common, box 50 sq. ft.	1,394	8,411	2,106	11,781	28,830	131,644	20,220	115,032
Plate glass, unsilvered, sq. ft.	73,328	31,710	92,759	30,813	1,398,427	414,015	1,047,381	296,034
Other window and plate glass, n.e.s. lbs.	181,082	15,110	293,185	30,242	1,592,814	168,113	1,750,985	205,341
Glass containers (bottles, vials and jars) lbs.	4,542,278	207,021	4,218,442	215,783	45,712,462	2,160,909	48,484,261	2,223,773
Table glassware, plain lbs.	1,687,178	169,187	1,470,695	143,614	12,227,631	1,321,320	12,810,332	1,297,966
Table and other glassware, cut or engraved lbs.	55,380	18,506	31,016	9,553	375,293	115,193	387,705	111,596
Glassware for lighting—								
Lamp chimneys and lantern globes lbs.	111,398	21,163	92,981	21,389	1,590,377	279,067	1,429,045	261,161
Globes and shades for lighting fixtures lbs.	114,904	32,335	117,702	39,307	948,613	289,890	1,162,828	360,096
Lamps and other illuminating devices, chiefly of glass lbs.	63,272	20,074	32,166	9,090	762,357	221,032	625,577	161,342
Chemical glassware lbs.	25,157	21,814	19,510	15,783	168,204	139,932	168,611	139,908
Electrical glassware, except for lighting lbs.	82,058	19,047	157,599	22,776	1,911,120	192,136	2,245,652	209,842
Other glassware, n.e.s. lbs.	611,995	116,793	803,344	122,730	6,755,621	1,123,658	5,822,099	1,076,454

IMPORTS

Corrected to October 24, 1925

Glass (total)	.....	$1,592,367	.....	$1,444,625	.....	$15,052,164	.....	$13,083,823
Cylinder, crown and sheet—								
Unpolished, lbs. dut.	1,873,748	104,661	2,079,853	111,681	25,017,058	1,433,977	35,381,329	1,874,362
Bent, ground, beveled, colored, painted, etc., and polished dut.	.....	38,848	.....	33,823	.....	378,264	.....	420,441
Plate Glass—								
Unsilvered, sq. ft. dut.	1,304,662	645,667	1,116,634	481,919	13,663,915	8,309,351	12,140,394	5,781,794
Fluted, rolled, etc., or silvered, or containing wire netting, sq. ft. dut.	158,180	37,601	142,918	24,831	2,127,517	283,309	997,947	157,580
Containers—bottles, vials, etc. dut.	.....	13,977	.....	15,349	.....	156,417	.....	132,482
Table and kitchen utensils, lbs. dut.	105,719	28,438	57,909	10,554	691,609	149,618	405,960	90,919
Glassware, cut or decorated, lbs. dut.	511,104	236,283	461,992	263,806	2,822,450	1,333,468	2,965,098	1,607,619
Blown glassware, n. e. s., lbs. dut.								
Bottles, ornaments, etc., lbs. dut.	1,037,313	261,640	749,942	233,787	4 199,264	1,277,782	3,045,613	969,151
Bulbs or electric lamps, number dut.	536,324	6,039	1,694,508	16,376	10 772 843	150,677	14,096,703	145,483
Chimneys, globes, shades, etc., lbs. dut.	527,883	105,826	370,685	84,087	3,554,387	644,505	3,745,097	809,658
Articles and utensils for chemical, scientific, and experimental purposes, lbs. dut.	71,775	30,963	98,544	47,316	730,077	254,641	721,392	265,109
Other glassware dut.	.....	82,424	.....	121,096	.....	680,155	.....	829,225

The Glass Industry

THE MONTHLY JOURNAL OF

Glass Technology, Engineering, Raw Materials, Glass Factory Equipment and Operation

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JANUARY TO DECEMBER, 1925

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NEW YORK

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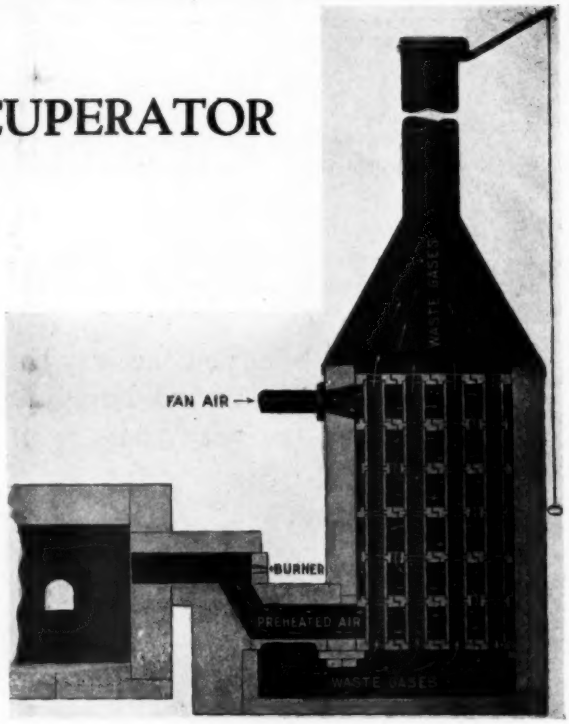

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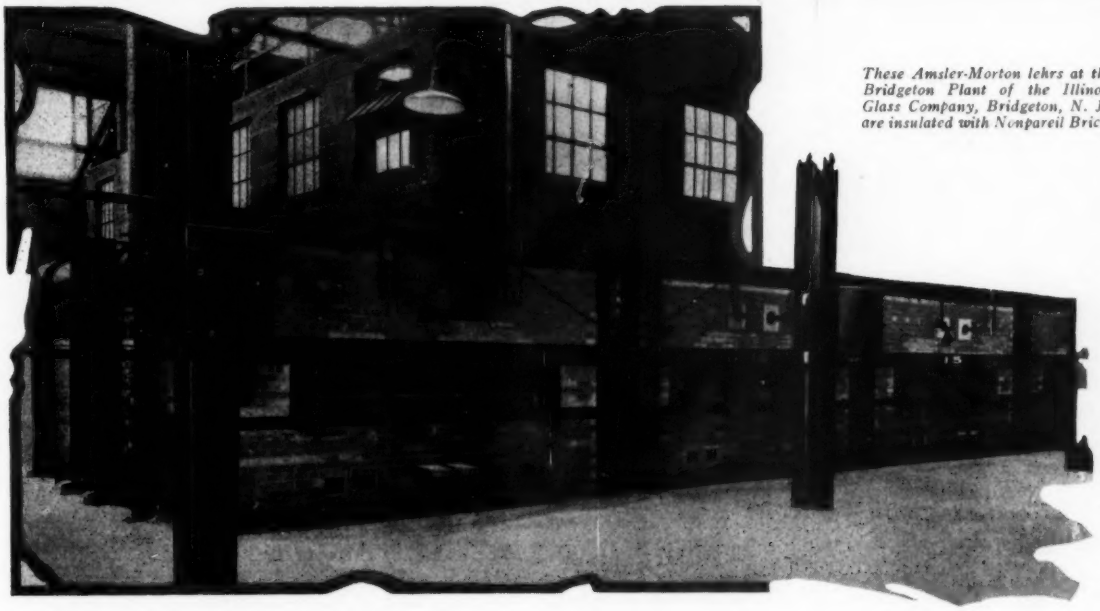

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NIELSEN SURVEYS

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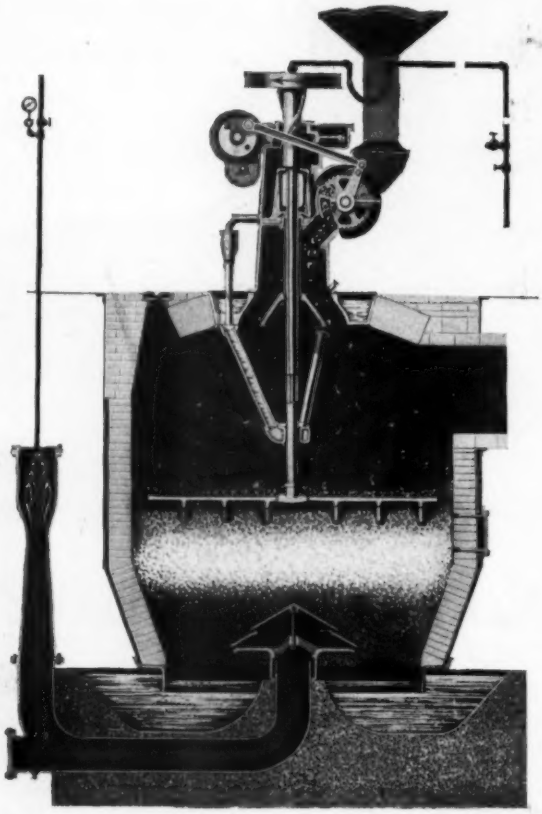

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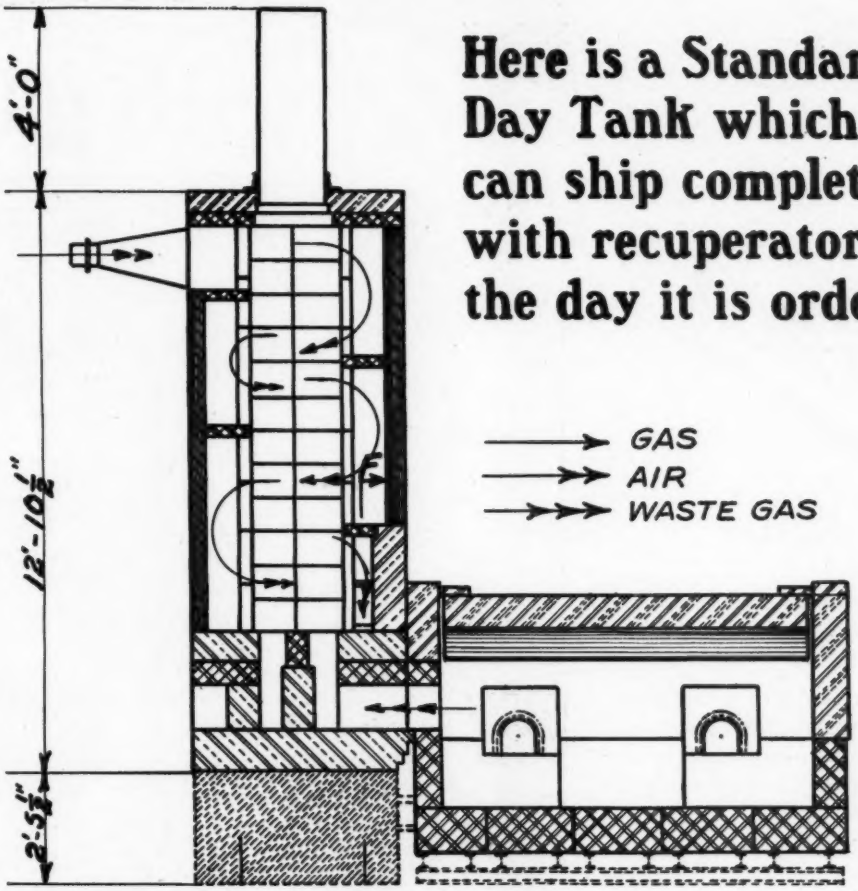

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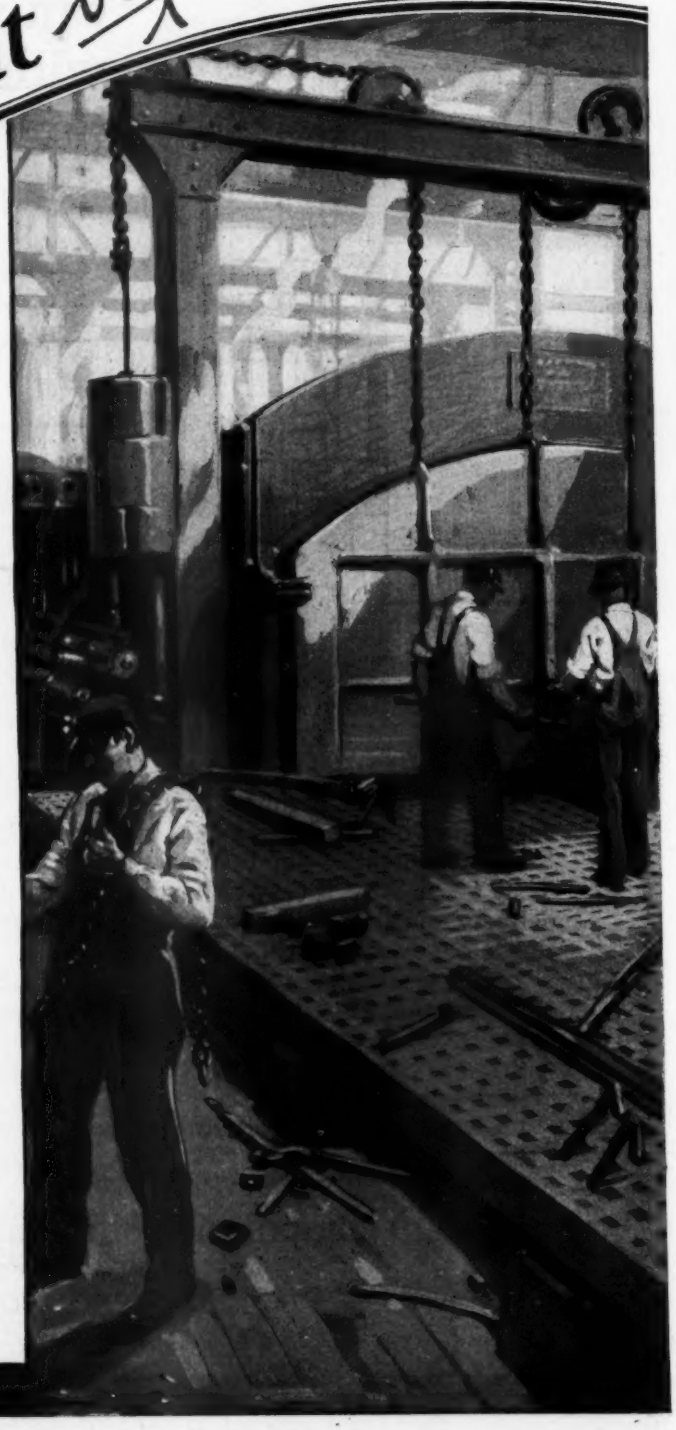

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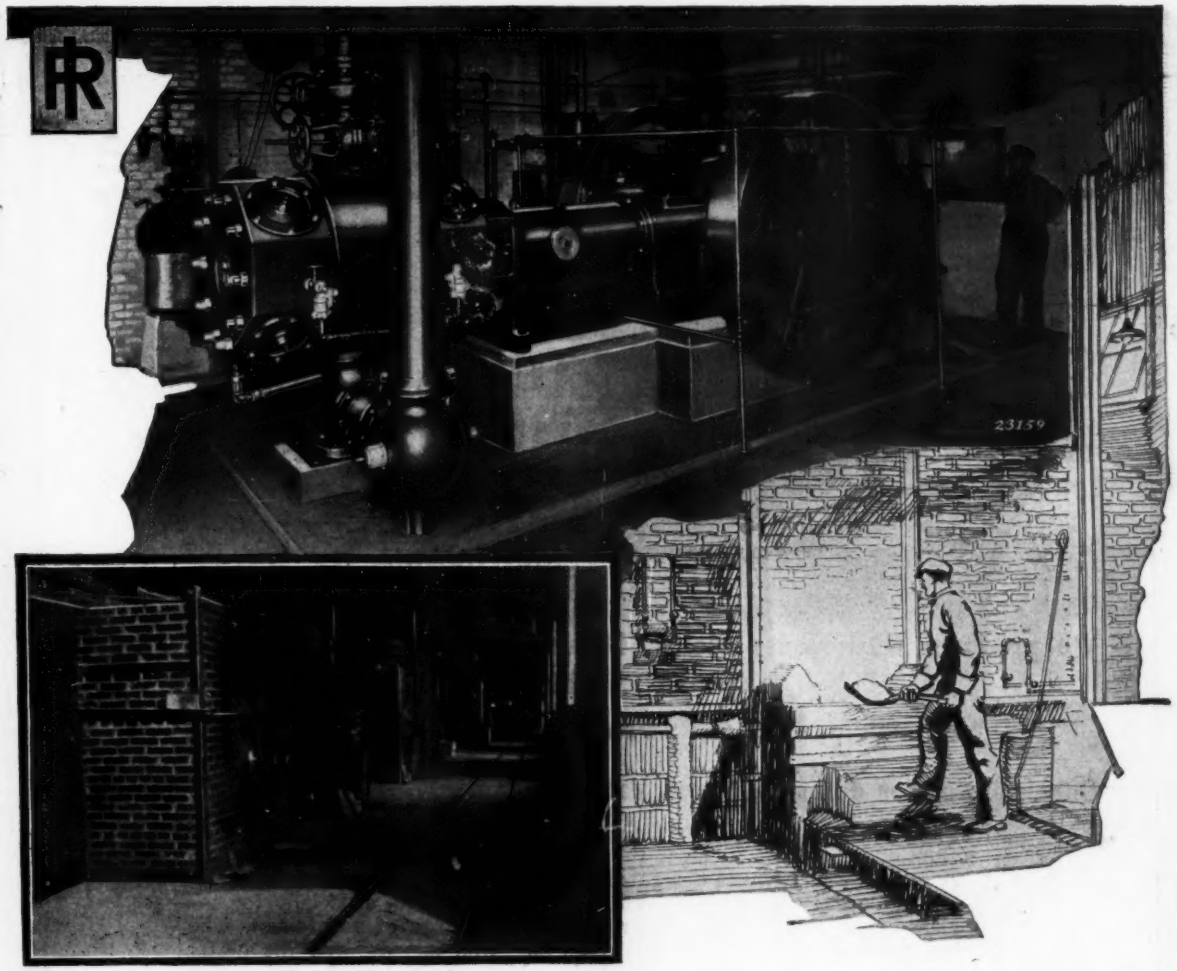

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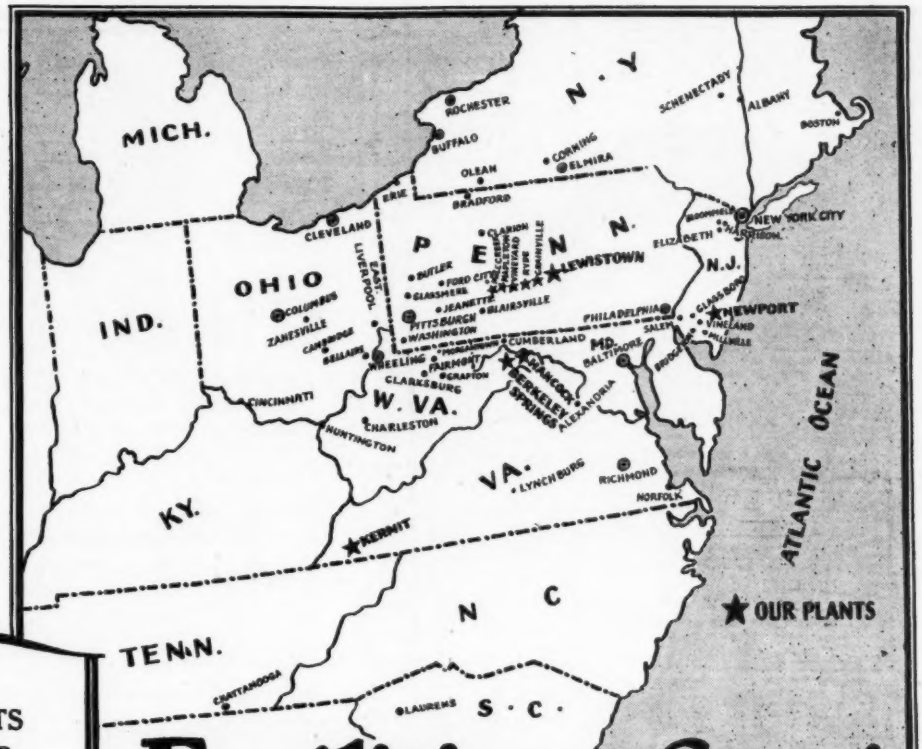

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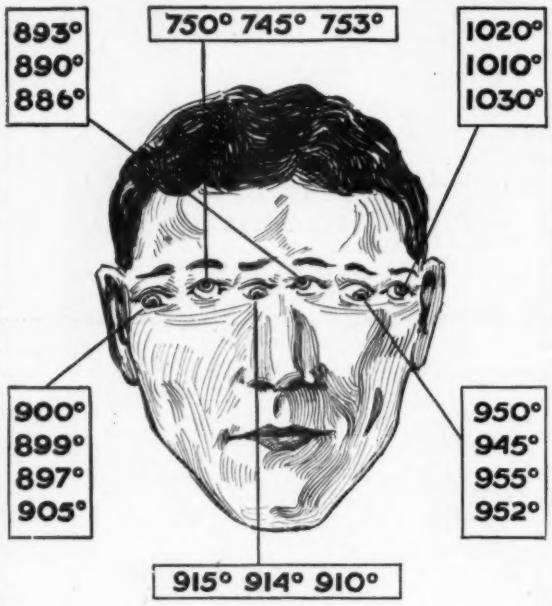

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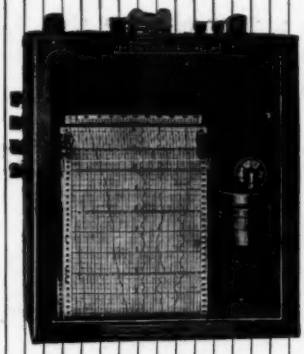

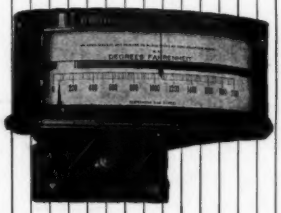

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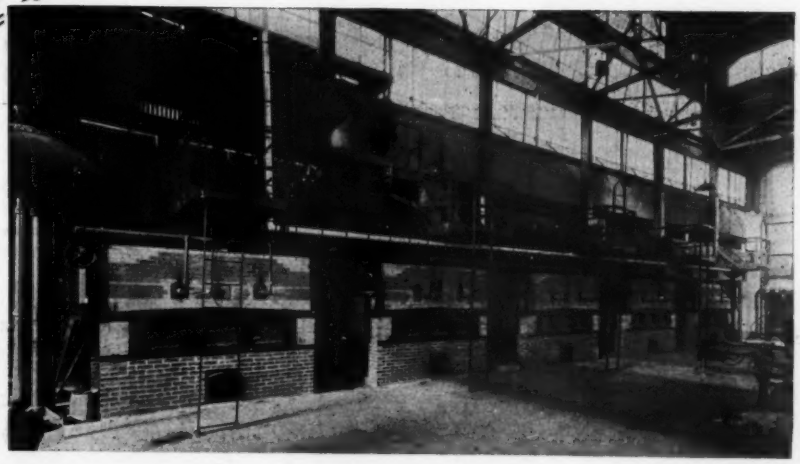

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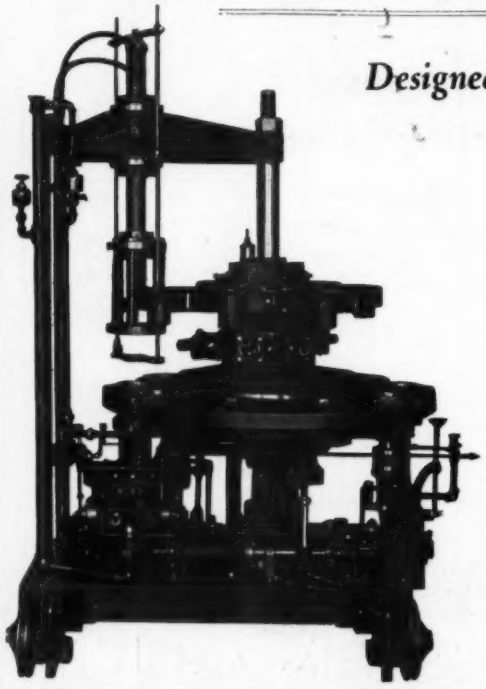

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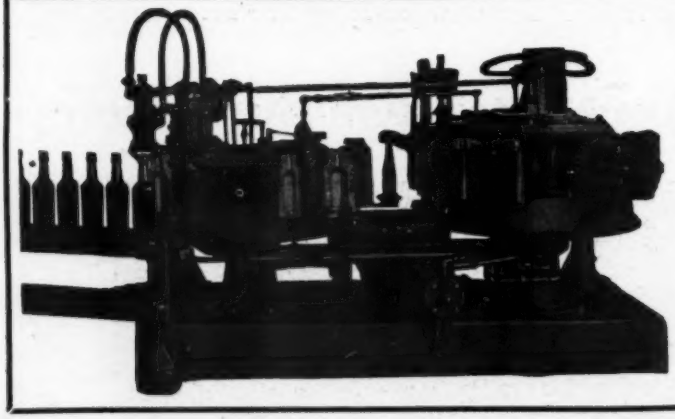

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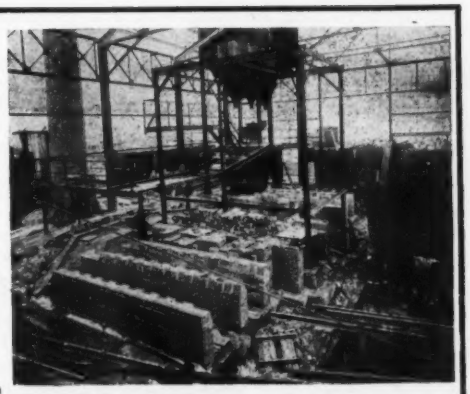

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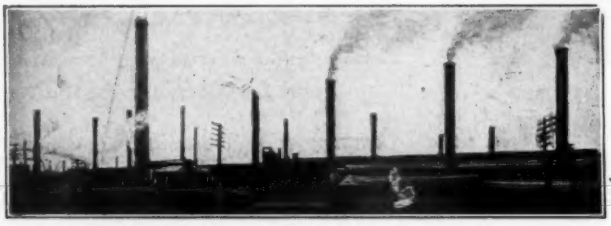

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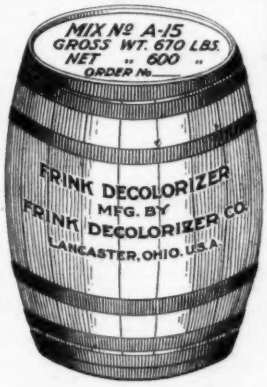

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(Continued on page 22)

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Potash Carbonate

ESTABLISHED 1871

Manufacturers — Importers — Grinders

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GLASS WORKING MACHINERY
Automatic and Semi-Automatic Bottle Blowing, Electric Presses, etc.
Hartford-Empire Co., Hartford, Conn.
Lynch Glass Machinery Company, Anderson, Ind.
Wm. J. Miller, Inc., Swissvale, Pa.
Miller Machine & Mold Works, Columbus, Ohio.
O'Neill Machine Co., The, Toledo, Ohio.
O'Neill Machine Co., 10 Savoy St., Strand, London, W. C. 2, England.

GLASS WORKING MACHINERY REBUILT
Washington Mould, Machine & Foundry Co., Inc., Washington, Pa.

INSULATING BRICK, FURNACE AND BOILER
Armstrong Cork & Insulation Co., 188 24th St., Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Simplex Engineering Co., Washington, Pa.

INSULATION, HEAT
Armstrong Cork & Insulation Co., 188 24th St., Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.

KRYOLITH
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.

LEHR FEEDERS (See Automatic Conveyors and Lehr Feeders)

LEHRS
Electric
General Electric Co., Schenectady, N. Y.
"Fireless"
Hartford-Empire Co., Hartford, Conn.
Muffle
Amsler-Morton Company, The, Pittsburgh, Pa.
Cruikshank, J. W., Eng'r'g Co., Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Hartford-Empire Co., Hartford, Conn.
Simplex Engineering Co., Washington, Pa.

LEPIDOLITE
Drakenfeld, B. F., & Co., Inc., New York.

LITHARGE
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Roessler & Hasslacher Chemical Co., New York.

MACHINE SHOP SERVICE
Washington Mould, Machine & Foundry Co., Inc., Washington, Pa.

MANGANESE
Drakenfeld, B. F., & Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Roessler & Hasslacher Chemical Co., New York.
Wiarda, John C., & Co., Brooklyn, N. Y.

MIXERS, BATCH (See Batch Handling Systems)

MOLDS, MACHINE AND HAND
Wm. J. Miller, Inc., Swissvale, Pa.
Miller Machine & Mold Works, Columbus, Ohio.
O'Neill Machine Co., The, Toledo, Ohio.
O'Neill Machine Co., 10 Savoy St., Strand, London, W. C. 2, England.
Toledo Mould Co., Factories Bldg., Toledo, O.
Washington Mould, Machine & Foundry Co., Inc., Washington, Pa.

MOTORS, ELECTRIC
General Electric Co., Schenectady, N. Y.

OIL ENGINES
Ingersoll-Rand Co., New York.

OPACIFIERS
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.

PATTERNS, WOOD AND ALUMINUM
Washington Mould, Machine & Foundry Co., Inc., Washington, Pa.

POWDERED BLUE
Drakenfeld, B. F., & Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Roessler & Hasslacher Chemical Co., New York.
Sharp-Schurtz Company, Lancaster, O.
Vitro Manufacturing Co., Pittsburgh, Pa.

POWER PLANTS
Simplex Engineering Co., Washington, Pa.
Wiederholt Construction Co., 625 Bank of Commerce Bldg., St. Louis, Mo.

PRESSES REBUILT
Washington Mould, Machine & Foundry Co., Inc., Washington, Pa.

PRODUCER GAS PLANTS
Amsler-Morton Company, The, Pittsburgh, Pa.
Chapman Engineering Co., Mount Vernon, Ohio.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Morgan Construction Company, Worcester, Mass.
Simplex Engineering Co., Washington, Pa.
Wood, R. D., & Co., Philadelphia, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

PUMPS
Vacuum
Ingersoll-Rand Co., New York.

PYROMETERS, RECORDING and INDICATING
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Engelhard, Charles, Inc., New York.
Wilson-Maeulen Co., 385 Concord Ave., New York.

PYROMETER TUBES
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Engelhard, Charles, Inc., New York.
Wilson-Maeulen Co., 385 Concord Ave., New York.

RECORDERS, ELECTRIC CO_2
Brown Instrument Co., Philadelphia, Pa.
Charles Engelhard, Inc., 30 Church St., New York.

REFRACTORIES (See also Fire Brick)
Glass House
Amsler-Morton Company, The, Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Laclede-Christy Clay Products Co., St. Louis, Mo.
Mitchell Clay Mfg. Co., St. Louis, Mo.
Pittsburgh Plate Glass Co., Refractories Dept., Pittsburgh, Pa.
Russell Engineering Co., St. Louis, Mo.
Simplex Engineering Co., Washington, Pa.

REVERSING VALVES, GAS AND AIR
Amsler-Morton Company, The, Pittsburgh, Pa.
Chapman Engineering Co., Mt. Vernon, Ohio.
Cruikshank, J. W., Eng'r'g Co., Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Simplex Engineering Co., Washington, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

SALT CAKE
Grasselli Chemical Co., Cleveland, Ohio.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

SAND, GLASS
Berkeley Glass Sand Co., Berkeley Springs, W. Va.
Pennsylvania Glass Sand Co., Lewistown, Pa.
United States Silica Co., Chicago, Ill.
Wedron Silica Co., Chicago, Ill.

SELENIUM
Drakenfeld, B. F., & Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Roessler & Hasslacher Chemical Co., New York.
Vitro Manufacturing Co., Pittsburgh, Pa.

SODA ASH
Diamond Alkali Co., Pittsburgh, Pa.
Michigan Alkali Co., New York.
Roessler & Hasslacher Chemical Co., New York.
Solvay Process Co., Syracuse, N. Y.
Wiarda, John C., & Co., 265 Green St., Brooklyn, N. Y.
Wing & Evans, Inc., 40 Rector St., New York.

SODIUM SELENITE
Drakenfeld, B. F., & Co., Inc., New York.
Roessler & Hasslacher Chemical Co., New York.

STORAGE BINS, RAW MATERIALS (See also Coal Handling and Storage Systems, and Batch Handling and Mixing Systems)
Amsler-Morton Company, The, Pittsburgh, Pa.
Cruikshank, J. W., Eng'r'g Co., Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Russell Engineering Co., St. Louis, Mo.
Simplex Engineering Co., Washington, Pa.
Wiederholdt Construction Co., St. Louis, Mo.

TANK BLOCKS
Amsler-Morton Company, The, Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Mitchell Clay Mfg. Co., St. Louis, Mo.
Pittsburgh Plate Glass Co., Refractories Dept., Pittsburgh, Pa.
Russell Engineering Co., St. Louis, Mo.
Simplex Engineering Co., Washington, Pa.

TANK FURNACES (See Furnaces)

THERMOMETERS
Electric
Brown Instrument Co., Philadelphia, Pa.
Charles Engelhard, Inc., 30 Church St., New York.
Indicating and Recording.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Engelhard, Chas., Inc., New York.
Wilson-Maeulen Co., New York.

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URANIUM OXIDE
Drakenfeld, B. F., & Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Roessler & Hasslacher Chemical Co., New York.
Vitro Manufacturing Co., Pittsburgh, Pa.

WINDOW GLASS
Johnston Brokerage Company, Pittsburgh, Pa.

ZINC OXIDE
Drakenfeld, B. F., & Co., Inc., New York.

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CONSULTANT ON GLASS PROBLEMS

Tank Glass a Specialty

340 SPRING STREET READING, PA.

GREENLAND
KRYOLITH
The Standard Opacifier

Nature's unvarying combination of Fluorine, Soda and Alumina (with less than 2% Silica) has made GREENLAND KRYOLITH the ideal glass opacifier. For over 60 years it has shown its worth in the ware and on the cost sheet.

NATRONA HYDRATE OF ALUMINA, GLASSMAKERS SALT CAKE AND OTHER CHEMICALS FOR THE GLASS INDUSTRY.

PENNSYLVANIA SALT M'F'G. CO.

SALES OFFICES
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New York
Chicago
St. Louis

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WIDENER BLD'G.
Philadelphia
Penna.

INCORPORATED 1850

Tank Blocks, Prepared Clays
Covered Pots

"Stones" from clays have been eliminated by the use of our

Exclusive Patented Clay Batches

REFRACTORIES DEPARTMENT
Pittsburgh Plate Glass Co.
PITTSBURGH, PA.

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Sharp-Schurtz Company

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For the Glass Industry

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COLUMBUS, OHIO

TYPE "L" PRODUCER

How One Manager Cut Costs In A Mid-West Glass Factory!

No. 8 Capacity 2750 lbs. per hour
No. 10 Capacity 4000 lbs. per hour

	1924	1925	
Operation in Year of			
Gas Producers in Daily Use	3 Hand Operated	1 W.S.M. No. 8 Full Mechanical	
Gas Men (8 Hour Turns) Per Day	9	3	
Ashman Per Day	1	1	
Coal Gasified Per Day	36. Tons	28. Tons	
Glass—Raw Materials Charged Per Day	60.4 Tons	60.4 Tons	
Glass—Product Per Day	54. Tons	54. Tons	
Results			
Coal Ratio to Glass Product	0.67	0.52	
Labor Per Ton of Glass Product Hours	1.47	0.59	
Saving—Coal Per Day Tons		.8.	@$3.00=$24.00
Saving—Labor Per Day Hours		48.	@ 0.45= 21.60
Saving—Total Per Day			$45.60
Saving—Per Year (Operating Glass Furnace 270 Days or 9 Months)			$12,312.00

A W.S.M. Gas Producer Engineer Will Call on Request

The Wellman-Seaver-Morgan Company

7002 Central Avenue

CLEVELAND, OHIO, U. S. A.

Associated Companies

The Wellman Smith Owen Engineering Corporation, Ltd., London, England
Wellman Smith Owen (France) Soc. Anon., Paris, France

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